WHAT AGENT SKILLS ADD: A CAUSAL AUDIT OF TASK CONVENTIONS

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ABSTRACT

Does a Skill improve an agent's capability, or supply a task convention that the evaluation expects but the task omits? We audit this distinction through matched content interventions and prospectively frozen claim gates. Across 378 retained rollouts, a benchmark-native pilot nominates an unstated projection rule; a frozen 54-rollout removal/insertion experiment finds 36/36 hidden distance-clause passes with exact guidance versus 0/18 with generic controls. A 270-rollout documentation-by-Skill factorial in five constructed families finds a 0.467 correct-minus-generic gain when documentation omits the rule (simultaneous interval [0.300, 0.633]; adjusted $p = 0.000778$), but only three families have positive increments, missing the registered four-family recurrence gate. Harm and repair gates also fail. An independent 1,152-opportunity operational test leaves information-source attenuation unresolved (0.085938, 95% interval [-0.208456, 0.380331]); each condition has 97/128 zero-scored process failures. A fresh external-rule factorial across eight source lineages and 1,536 opportunities also misses its recurrence gate: source-information difference 0.053711 (simultaneous interval [-0.097362, 0.204784]). Its matched Skill-minus-document difference is 0.001628 ([-0.149445, 0.152701]), within a prespecified broad ±0.25 material-equivalence margin, not proof of equal carriers. The evidence supports a local effect of convention-and-sequence guidance and a finite-bank gain, not a general mechanism or authoring rule. Skill evaluation must distinguish supplying missing task information from recurring or carrier-specific value.

1 INTRODUCTION

Agent Skills package instructions and resources for language-model agents, often through progressive loading (Agent Skills project, n.d.; Anthropic, 2026; OpenAI, n.d.). A Skill may raise a score by stating a convention the evaluator requires but the task omits. That is useful information, not yet evidence of transferable capability or a Skill-format benefit.

This ambiguity matters because Skill gains are heterogeneous. SkillsBench finds substantial benefits from curated packages, whereas other evaluations find redundancy, regressions, and sensitivity to retrieval or invocation (X. Li et al., 2026; T. Han et al., 2026; Y. Liu et al., 2026; Su et al., 2026; Chen et al., 2026a; Tank and Nama, 2026). Whole-Skill comparisons also bundle task-relevant content with extra context, headings, imperatives, and resources. Structure, delivery, or evaluator alignment may explain a gain without transferable reasoning (Iscan, 2026; Chen et al., 2026b; Saha, 2026). Trace differences and self-reported reliance cannot by themselves resolve these causal alternatives.

Figure 1 separates three questions: does specified Skill content cause a local gain, does that gain recur across task families, and does the Skill carrier add value beyond an ordinary document with the same propositions? A pilot nominates an omitted projection convention; a separately frozen removal/insertion experiment tests it with sham and paraphrase controls. A five-family factorial then tests a prospective recurrence gate, not merely a positive pooled effect.

Exact guidance yields a local effect and finite-bank gain, but recurrence fails. Separate information-source confirmation is unresolved amid process failures; an eight-lineage panel also misses its source-information gate and bounds only a large carrier difference. These findings answer different questions: local causality, recurrence and packaging value require separate evidence before an authoring rule is justified.

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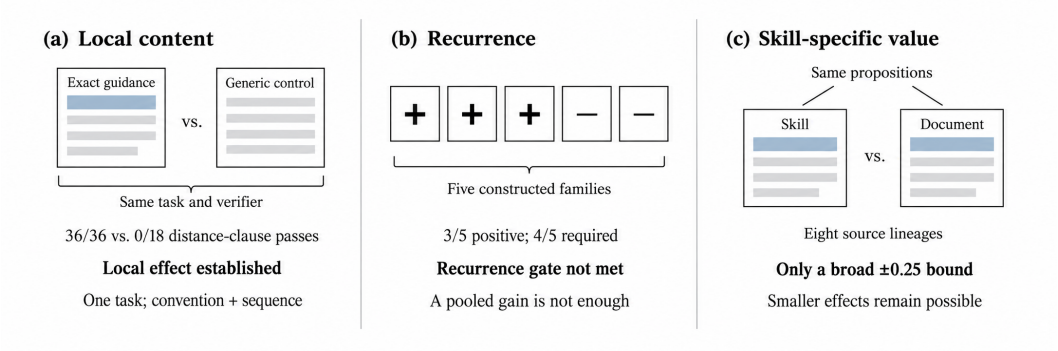


Figure 1: Three questions require separate evidence. Panels summarize distinct studies, not stages of one experiment. (a) Exact convention-and-sequence guidance changes one hidden clause. (b) Symbols show positive-family counts, not identities; recurrence requires four of five. (c) The matched-carrier test bounds only large fixed-panel differences; ±0.25 is the prespecified margin, not an estimated effect.

2 Related Work

Whole-Skill benchmarks establish utility and heterogeneity, not the causal value of one proposition (X. Li et al., 2026; T. Han et al., 2026). Randomized library inclusion, gain–regression decompositions, and paired failure taxonomies already study conditional utility (Wang et al., 2026; Tank and Nama, 2026; Dong et al., 2026). Skill Theater and controlled scaffold studies intervene on semantic content and presentation (Hu et al., 2026; Iscan, 2026). We do not claim the first ablation, placebo, or causal evaluation of a Skill.

The closest attribution work values internal units, controls context cost, or separates interface alignment from transfer (T. Li et al., 2026; C. Liu et al., 2026; Chen et al., 2026b). Demystifying Agent Skills compares representations derived from the same trajectories and describes procedural anchoring (Jiang et al., 2026). SkillEval, SkillHEX, and SkillProx address quality or iterative optimization (J. Han et al., 2026; Feng et al., 2026; Zheng et al., 2026). More recently, execution as subagents changes the value of procedural input-output contracts (Piriyakulkij et al., 2026); scientific Skill libraries also explicitly distinguish procedural coverage from unevaluated utility (Kassis et al., 2026).

The distinction between examples and explicit instructions also predates Skills. Instruction induction generates task descriptions from examples and evaluates their execution (Honovich et al., 2023); hypothesis search generates explicit candidate rules, implements programs, and checks them against examples (Wang et al., 2024). Study J is therefore a controlled information-source calibration, not a claim to invent explicit rule guidance. Appendix A.5 sets out the inference and measurement boundaries of this comparison.

Our contribution is an inspectable local oracle-convention intervention, prospectively frozen tests that do not meet their recurrence criteria, and a content-matched Skill/document comparison that bounds only a large carrier effect. The documentation levels are not a validated graded diagnosticity moderator, and no result establishes a transferable authoring rule. Appendix A covers memory, delivery, reuse and source-quality boundaries.

3 Method

3.1 Identification design and evidence units

The discovery pilot assigns three outcome-blind selected benchmark-native pairs (earthquake analysis, energy unit commitment, TicToc) to no target Skill (C0), intact Skill (C1), or package-matched generic placebo (C2): six fresh rollouts per arm, 54 total. C1-C0 measures whole-package effect; C1-C2 separates task-relevant content from Skill-shaped context but not one sentence or resource. Hidden verifiers retain completion and clause-level outcomes. The three pairs, not 54 rollouts, are the discovery settings.

Randomized schedules, isolated sessions, common cues, denied task-side network access, and hash-bound captures precede trusted verification. Failures remain under frozen rules without outcome-driven retries. The pilot nominates a mechanism; the intervention and factorial are separately frozen tests. Appendix B gives selection, runtime, assignment and measurement details.

3.2 Prospective convention-content intervention

The earthquake Skill and oracle specify EPSG:4087, whereas the public task does not name a CRS. Before new outcomes, we froze six conditions: intact, genericized and sham-edited intact Skills; and a matched-placebo parent with minimal exact, matched generic or independently paraphrased exact guidance. Diffs and a proposition map constrain edits to the convention and execution sequence. Each condition has nine fresh rollouts (54 total) in balanced waves with common task, prompt, runtime and verifier but disjoint sessions. Complete trajectories were hash-bound before verification; one look, no extension or automatic retry were fixed.

The primary endpoint is the hidden distance-tolerance clause. Three one-sided within-wave exact label-swap tests compare intact with genericized, exact with generic insertion, and paraphrased exact with generic insertion; Holm adjusts these tests. The local gate requires all three differences positive at adjusted $p \leq 0.05$, with sham and paraphrase compatibility within $2/9$. These are not equivalence guards or evidence of mediation by process signatures; Appendix B.9 specifies the exact assignment, enumeration and uncertainty.

3.3 Controlled convention-gap confirmation

We separately froze a 3-by-3 factorial in five constructed convention families: business-day ledgers, layered configuration, artifact fingerprints, software releases and settlement rounding. Family, not generated instance, is the recurrence unit; these are not independently sampled populations or human-authored families. Documentation D0 omits only the focal convention, D1 states the current rule, and D2 states an incompatible legacy rule. Forced-exposure Skill S0 is generic, S1 supplies the correct convention and sequence, and S2 an equally specific incompatible sequence; nonfocal presentation is matched. Treatments vary the general convention and sequence, not an instance-specific answer.

One fixed ledger block makes the intervention inspectable. Its active profile is ledger-v2 and its 15-record input is identical in all nine cells. D0 asks the agent to identify the applicable zone and cutoff; D1 states the current America/Chicago 04:00, left-closed/right-open, void-excluding rule; D2 states a legacy UTC 00:00 rule. S0 supplies only the shared workflow, S1 states the current rule, and S2 states the same legacy rule. For example, posted USD events at 2026-01-14 09:59Z and 10:00Z fall on different business dates under the current rule (January 13 and 14). The trusted verifier compares the complete sorted business-day array, required counts and totals, strict output schema, and unchanged inputs against a frozen oracle. This is an illustration of the prespecified material contrast, not a selected effect estimate; the complete agent-visible text, records, and expected rows are in Appendix B.8.

An objective-invalidity development stage contributed 45 excluded runs. Six untouched instances per family then formed 30 complete nine-cell blocks and 270 retained rollouts, with isolated namespaces, opaque slot permutations, and hash-bound materials and analysis. One look, no adaptive extension or retry, and failure counting were frozen. Appendix B.7 defines the rules; Appendix B.8 shows one complete matched block and verifier target.

3.4 Confirmation endpoints, analysis, and claim gate

The primary endpoint requires every convention-sensitive output to match the hidden current-convention oracle. The verifier also records full success and side effects, but neither apparent Skill use nor any secondary field creates a post-treatment exclusion.

Four one-sided primary contrasts are gap addition (D0S1-D0S0), gap correctness (D0S1-D0S2), conflicting-Skill harm (D1S0-D1S2), and stale-document repair (D2S1-D2S0). Exact tests swap the focal Skill labels within complete blocks, holding seven other cells fixed; Holm adjustment covers all four. Exactness holds for sharp no-effect nulls under assignment and no interference, not

a zero heterogeneous average effect (Hemerik and Goeman, 2018; Wu and Ding, 2021). Equal-instance risk differences weight the five families equally. A frozen within-family block bootstrap gives simultaneous conditional intervals, not population intervals over new families. Appendix B.10 specifies the full 200,000-replicate procedure and concentration diagnostics.

Outside that multiplicity family, the redundancy guard requires $|\mathrm{RD}(\mathrm{D1S1} - \mathrm{D1S0})| \leq 0.20$: a gross-compatibility threshold, not an equivalence test. D1S0 versus D0S1 compares ordinary-note and Skill delivery descriptively. The secondary documentation-by-Skill contrast has a registered joint-swap reference exact only under sharp documentation invariance, not for a zero heterogeneous average (Dasgupta et al., 2015; Wu and Ding, 2021).

The preregistered recurring-principle gate is intentionally stronger than a positive pooled effect. It requires positive gap-addition and gap-correctness effects with Holm-adjusted $p \leq 0.05$, a passing redundancy guard, gap addition strictly positive in at least four valid unrelated families and nonnegative in the fifth, positive leave-one-family-out effects, and no load-bearing integrity failure. Harm and repair need their own adjusted and family-direction gates. Failure prohibits the planned prospective authoring experiment; thresholds cannot change after outcomes.

3.5 Outcome exclusions and separate development calibration

A later diagnosticity study (Study G) stopped after 171 of 256 frozen waves; its v11 epoch and earlier attempts were excluded unopened, without partial collection or retry. No Study H or I outcome exists: H failed panel admission, and I was gated on a complete G mechanism result. These extensions are not presented as completed methods or results and cannot enter a claim.

The separately frozen, 72-cell Study J development calibration contrasts underdetermined examples, rule-identifying examples, and explicit rules (Appendix F). Its sole intake reports all cells in Section 4.4 and Appendix G. It is not pooled with the original 378 observations, an independent family replication, or permission to activate H/I. The operational confirmation targets attenuation of the correct-minus-generic Skill increment from underdetermined to rule-identifying examples, not the underdetermined-example increment alone.

A fresh operational confirmation was separately frozen and launched. Its prospective method is specified in Appendix H; its admitted single-intake report is retained in Section 4.5 and Appendix I. Runtime qualification and execution progress are not scientific evidence. No earlier bank is pooled with this confirmation.

3.6 Prospective external-rule information and carrier test

After the initial complete-paper review, a separate Study K tested two unresolved questions without reopening prior epochs: recurrence across externally determined rule lineages, and whether placing identical exact propositions in a Skill rather than an equally discoverable ordinary document changes performance. Eight fixed-order source lineages passed source, rights and independence gates. Each had one researcher-constructed coding task, four prespecified rule branches and sixteen hidden verifier items outside the agent workspace. Public rule authorship does not make the tasks or Skill wording independently authored.

The prospectively frozen document/Skill factorial had four cells (N/N, E/N, N/E, E/E), with N neutral and E exact. All cells shared the task, both file locations, discovery pointers, model/runtime, budgets and trusted verifier; exact and neutral cards were content-matched across surfaces. Forty-eight complete four-cell blocks per lineage yielded 384 atomic waves and 1,536 planned fresh opportunities. A single seed assigned within-wave slot permutations after the protocol freeze. The fixed score was four branch accuracies of four items each. Valid-opportunity process failures scored zero; no failed cell or unsealed wave was retried.

The two protected finite-panel contrasts were source information (N/E minus N/N) and Skill-versus-document carrier (N/E minus E/N), with a prespecified Bonferroni/Hoeffding simultaneous half-width of 0.151073. A positive source claim requires a positive lower bound and positive points in all four prespecified no-direct-oracle lineages; the other four retain direct-oracle risk. Carrier classification first checks the entire interval against ±0.25, equivalent to four of sixteen items, not a deployment-derived tolerance. Otherwise a directional bound and seven concordant family signs

are required (complete ordered gates: Appendix B.12). Lineages have equal weight; blocks and verifier items are not independent source families (Appendix B.11). One terminal look required all 384 sealed waves, absent ownership and an exclusive intake lock. All arms, pairwise contrasts, family/branch rows, failures, strata and interaction remain in fixed order. Inference is limited to these constructed tasks and the frozen model/runtime.

For the first fixed-order lineage, JSON Patch, every cell asked the same `solve({doc, patch})` function to return the transformed JSON value. The exact card in E/N's document is byte-identical to N/E's Skill card; among its rules, array `add` inserts before an existing zero-based position, while the neutral card has the same callable and workflow scaffold but no rule proposition. Thus an illustrative, non-scored request adding 9 at `/x/1` to `{"x":[1,2]}` should yield `{"x":[1,9,2]}`. The trusted evaluator, outside the agent workspace, instead used 16 frozen hidden requests across four rule branches and scored their complete structural outputs. Each opportunity used a fresh workspace and host-native Codex CLI 0.144.5 with `gpt-5.6-terra` at medium effort, network-denied macOS Seatbelt authoring, a separate trusted evaluator, and fixed 300/120-second authoring/evaluation bounds. The source, package, bank, runtime and analysis hashes are bound by the frozen manifest; rights-restricted source components require pinned reconstruction rather than unqualified redistribution.

4 Results

4.1 Pilot and exploratory localization

All 54 pilot outcomes are retained. Earthquake full success is 4/6 for the intact Skill and 0/6 for both no-Skill and placebo. Energy full success is 1/6 for the intact Skill and zero otherwise, but completion and mean clause performance deteriorate with that Skill. TicToc has one placebo success and zero in the other arms. Conservative simultaneous pilot intervals include zero: these are regime-finding observations, not three confirmed mechanisms.

The earthquake artifacts nominate a precise explanation: the intact Skill supplies EPSG:4087, matching the hidden oracle's distance convention, while other defensible choices give different distances. This observation alone does not establish semantic reliance, the physical superiority of that projection, or prevalence across tasks. It supplies the target for the prospective removal/insertion experiment below. Full pilot tables and the outcome-labeled exploratory localization are in Appendix C.

4.2 Removing and inserting exact guidance changes the local endpoint

All 54 assigned rollouts produced immutable outcomes and entered the locked analysis; no retry, extension, or infrastructure exclusion occurred. Table 1 reports the primary distance-clause endpoint and the secondary full-task endpoint. Every rollout exposed to the exact convention—whether through the intact Skill, a sham-edited copy, a minimal insertion, or an independently worded insertion—reported exactly 3878.27 km and passed the hidden distance clause. Neither generic-projection condition passed that clause. Generic insertion produced 3551.98 km in eight runs and 3561.87 km in one; genericized intact Skills produced 3551.98–3997.70 km (median 3551.98).

Table 1: Local convention intervention: primary distance-clause and secondary full-task success (nine rollouts per condition).

Condition	Distance-clause success	Full success	Reported distance (km)
Intact Skill	9/9	8/9	3878.27 in 9/9
Genericized intact Skill	0/9	0/9	3551.98–3997.70 (median 3551.98)
Sham-edited intact Skill	9/9	9/9	3878.27 in 9/9
Minimal exact-convention insertion	9/9	9/9	3878.27 in 9/9

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Table 1 (continued): Local convention intervention: primary distance-clause and secondary full-task success (nine rollouts per condition).

Condition	Distance-clause success	Full success	Reported distance (km)
Matched generic-projection insertion	0/9	0/9	3551.98–3561.87 (median 3551.98)
Paraphrased exact-convention insertion	9/9	9/9	3878.27 in 9/9

Each prespecified focal risk difference was +1.00. The six-arm simultaneous 95% exact bound was [0.088, 1.000] for intact minus genericized intact, exact insertion minus generic insertion, and paraphrased exact insertion minus generic insertion. The corresponding one-sided exact label-swap tests enumerated 729, 1296, and 729 assignments; Holm-adjusted p-values were 0.00274, 0.00231, and 0.00274, respectively. The primary-endpoint risk differences were zero for both descriptive compatibility checks (intact versus sham and exact versus paraphrased insertion), satisfying the frozen gross-incompatibility guard without constituting an equivalence claim.

The sole secondary full-success failure among the exact-convention conditions was one intact rollout that returned the correct event identity, coordinates, and 3878.27 km distance but an incorrect timestamp. Executable command-title signatures varied within every condition and had false negatives even when the reported distance was correct; as prespecified, they are behavioral telemetry, not mediation evidence.

The registered local gate therefore passes. In this frozen task–Skill setting, genericizing the convention and sequence eliminates the observed distance-clause success, while minimal exact insertion restores it. Sham and paraphrase controls argue against a generic editing effect or dependence on literal wording; they do not separate convention content from execution sequence. The result does not estimate how often tasks contain such convention gaps, show that EPSG:4087 is intrinsically preferable, or establish a recurring or prospective authoring principle. The benchmark Skill and oracle share a design lineage; the separately constructed confirmation in Section 4.3 therefore tests the broader channel without using this task as an independent recurrence unit.

4.3 A LARGE POOLED GAIN MISSES THE REGISTERED RECURRENCE CRITERION

All 270 assigned rollouts entered the single frozen analysis: 30 per factorial cell, without retry, extension or post-treatment exclusion. Four nonfocal failures were retained, no severe side effect occurred, and all five families remained load-bearing.

Table 2 reports all nine cells: the correct Skill improves success under a documentation gap, whereas arms are near ceiling when documentation already states the rule. The stale-note repair contrast is heterogeneous.

Table 2: Convention-clause success in all nine documentation-by-Skill cells (30 rollouts per cell).

Ordinary documentation	S0 generic Skill	S1 correct Skill	S2 incompatible Skill
D0 convention omitted	13/30 (43.3%)	27/30 (90.0%)	8/30 (26.7%)
D1 current convention stated	29/30 (96.7%)	27/30 (90.0%)	26/30 (86.7%)
D2 incompatible convention stated	22/30 (73.3%)	28/30 (93.3%)	8/30 (26.7%)

The four registered risk differences are gap addition +0.467 (simultaneous interval [0.300, 0.633], adjusted $p = 0.000778$), correctness under a gap +0.633 ([0.467, 0.800], $p = 0.00004196$), conflicting-Skill harm +0.100 ([-0.067, 0.267], $p = 0.1875$), and stale-document repair +0.200 ([0.033, 0.367], $p = 0.0703$). Gap addition is positive in three families and exactly zero in two. Figure 2 and Appendix E retain every registered interval and family contrast.

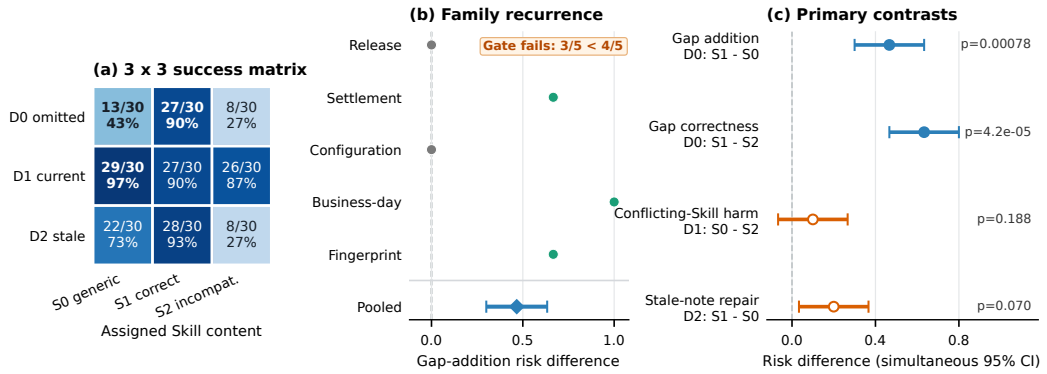


Figure 2: A pooled gain does not satisfy the recurrence gate. (a) Convention-clause success in all nine factorial cells. (b) Family-specific gap addition: green points are positive, gray points are zero, and the blue diamond is the pooled effect with its simultaneous 95% interval. Only three of the required four families are positive. (c) All four primary risk differences and simultaneous 95% intervals; filled blue markers pass Holm-adjusted tests, whereas open orange markers fail.

The redundancy contrast is D1S1-D1S0 = -0.067, within its gross-compatibility guard. The gap-minus-sufficient-documentation interaction is 0.533; its frozen joint-swap tail is $p = 15/65536 = 0.000229$ under sharp documentation invariance; we do not treat this as an exact test of zero average interaction. The descriptive ordinary-note versus Skill comparison is +1/15, not an equivalence test.

The recurring-principle gate fails: only three, not the required four, families have positive gap addition. The large average cannot change that frozen rule. Harm fails its adjusted and family-direction criteria; repair fails after Holm adjustment and has one negative family. We retain the finite-bank gain but do not license recurrence or boundary claims, and do not activate the gated prospective authoring study. A failed directional gate is not proof of zero effect or nonrecurrence elsewhere.

4.4 Development calibration: identifying examples remove the observed increment

All 72 planned opportunities completed one registered intake. Under underdetermined examples (E0), generic (K0), correct (K1), and inverted (K2) Skills achieved 5/8, 8/8, and 0/8 successes; under rule-identifying examples (E1) and explicit rules (E2), all three cells achieved 8/8. The correct-minus-generic increment was 3/8 at E0 and zero at E1/E2. These are descriptive calibration outcomes, not equivalence, precedence, recurrence, or internal-learning conclusions: only two orientations contribute to each family-condition rate. Appendix G retains every family, failure category, and fixed contrast. The separate operational confirmation in Section 4.5 tests the direction independently; this development bank is not pooled with it.

4.5 Operational confirmation of the information-source contrast

The admitted complete report contains 128/128 sealed waves, 1152/1,152 known opportunities and 0 unknown opportunities. The primary E0-minus-E1 attenuation point is 0.085938; arithmetic missingness bounds are [0.085938, 0.085938]. The sole two-sided 95% Bernstein interval is [-0.208456, 0.380331], using the unchanged full-sample radius 0.294394. The prespecified interval leaves the direction of the E0-to-E1 attenuation contrast unresolved in this fixed-slot bank.

This contrast alone establishes neither an E0 benefit nor information recovery or a zero E1 increment. All components, targets, failures and resources remain visible. No equivalence, internal rule learning, unseen-input correctness, population-family or future-backend inference, naturalistic transport, authoring value, or repair of the earlier recurrence gate follows. The prior banks remain separate.

Overall complete execution (all nine cells; fixed order):

Table 3: Study J complete execution. S = successes, U = unknown, N = planned; lower/upper are missingness bounds, not confidence intervals.

Cell	S	U	N	Point	Lower	Upper
E0K0	13	0	128	0.101562	0.101562	0.101562
E0K1	24	0	128	0.187500	0.187500	0.187500
E0K2	0	0	128	0.000000	0.000000	0.000000
E1K0	30	0	128	0.234375	0.234375	0.234375
E1K1	30	0	128	0.234375	0.234375	0.234375
E1K2	3	0	128	0.023438	0.023438	0.023438
E2K0	29	0	128	0.226562	0.226562	0.226562
E2K1	27	0	128	0.210938	0.210938	0.210938
E2K2	21	0	128	0.164062	0.164062	0.164062

S = successes, U = unknown, N = planned. Lower/upper are missingness bounds, not secondary confidence intervals. Appendix I retains every stratum, contrast, dependent target, failure and resource field.

4.6 External-rule information and carrier (Study K)

Eight externally determined rule lineages contributed 48 matched four-cell blocks each (384 atomic waves; 1,536 planned and complete agent opportunities). One prospectively frozen analysis counted valid-opportunity process failures as zero. The unit for source recurrence is a rule lineage, not an input, wave, repository, or agent call. The simultaneous intervals are conditional on independent block opportunities within this fixed panel; they are not across-rule-population intervals.

The all-eight arm means, in fixed N/N, E/N, N/E, E/E order, are 0.867350, 0.919434, 0.921061 and 0.924805. The protected source-information difference (N/E minus N/N) is 0.053711, simultaneous interval [-0.097362, 0.204784]: direction is unresolved and the recurrence gate fails. The matched Skill-minus-document difference (N/E minus E/N) is 0.001628, interval [-0.149445, 0.152701], wholly within the prespecified ±0.25 material-equivalence margin. This excludes only a very large *average* carrier difference on this score; effects as large as approximately 0.15 in either direction remain interval-compatible. Table 4 retains every lineage in fixed source order rather than selecting positive examples; its failures are zero-scored complete opportunities.

Table 4: Study K fixed-lineage contrasts: information = N/E−N/N; Skill−document = N/E−E/N. Process failures are zero-scored.

Rule lineage	Information difference	Skill−document	Process failures / 192
JSON Patch	0.001302	0.000000	1
TOML encoder	0.007812	0.001302	0
Unicode NFKC	0.000000	0.000000	0
JSON Schema	-0.007812	0.007812	4
YAML decoder	0.122396	0.020833	70
SQLLogicTest formatter	0.222656	0.000000	9
Git ignore	0.083333	-0.018229	20
XML Namespaces	0.000000	0.001302	9

Unicode, YAML, Git and XML were prespecified direct-oracle-risk lineages; they remain in the all-eight contrasts. Appendix J reports all four arm means, six pairwise contrasts, branch counts, failure cells and interaction for every lineage. No completed-only or selected-family effect is claimed.

The scope is the fixed externally sourced rules, constructed tasks and frozen model/runtime, not ecosystem prevalence, naturalistic transport, human authoring value or general XML/W3C conformance.

5 DISCUSSION

The local EPSG:4087 intervention changes the registered earthquake endpoint, not a general capability. It neither establishes the projection's physical superiority nor separates convention from sequence or Skill from documentation.

The factorial's positive average misses recurrence. Two zero increments do not prove population zeros, and additional instances or leave-one-family-out estimates do not create independent families. Documentation is not a validated graded moderator; failed harm/repair gates license no override or repair rule. Defaults, structure, salience and ceilings remain competing explanations.

Study J establishes neither internal rule learning nor attenuation. Each arm has 97/128 zero-scored failures; six workflows fail in every arm on all waves. Causes and effects absent failures are unknown; completed-only reanalysis would change the estimand.

Study K improves rule-source, not task/Skill-author independence. Its failed source gate includes one negative no-direct-oracle family point. The neutral mean 0.867350 leaves 0.132650 headroom, below the fixed 0.151073 half-width: holding that baseline fixed, even perfect exact-arm success cannot clear the gate. This arithmetic does not establish no effect. Smaller carrier effects, retrieval and ecosystem equivalence remain open; all 113 failures retain their zero scores and unknown causes.

The evaluation discipline is to identify added information, compare content-matched carriers, and test recurrence in the intended independent units while disclosing conventions and retaining failures. This is not an authoring recipe: predicting a new Skill's benefit or harm requires independent prospective evidence, not changed thresholds or excluded-data reuse.

6 LIMITATIONS

Selected benchmark pairs and AI-constructed families are not population samples; rollouts are not families. The recurrence gate neither estimates prevalence nor proves nonrecurrence when it fails. Earthquake Skill and oracle share a lineage; content, sequence and salience remain bundled. Forced exposure omits retrieval, activation, trust and progressive loading. Shape-matched placebos cannot fully match resource-backed packages; fixed runtimes limit transport.

Sharp-null tests and within-family bootstrap intervals differ; neither is an exact heterogeneous-average weak-null test, so repair interval/test conclusions can disagree. Excluded G and unlaunched H/I provide no evidence. Study J's four-family development bank has one target per family and E1/E2 ceilings; confirmation uses eight constructed workflows, not naturalistic authors. Its finite-slot interval excludes future-call inference and assumes no interference; 97 unknown-cause failures per condition remain counted. Neither bank establishes untested-input transfer or authoring value (Appendices D, F).

Study K uses a nonrandom eight-lineage panel, constructed tasks/prose, four direct-oracle-risk lineages and near-ceiling arms. Intervals require independent blocks, not random rule sampling. Its 113 unknown-cause failures, broad carrier margin and unresolved source effect preclude transport or authoring conclusions.

7 CONCLUSION

A Skill can raise a benchmark score by supplying an omitted convention. Our local causal effect and finite-bank gain do not establish recurrence; independent source confirmation is unresolved, and matched-carrier evidence bounds only large average differences. Measure the information added before attributing gains to Skill format. General mechanism, naturalistic transport and prospective authoring value remain unestablished.

REPRODUCIBILITY STATEMENT

Appendix B specifies selection, interventions, assignment, verifier targets, analysis procedures and claim gates; Appendix H specifies the separate operational confirmation. Appendix B.13 records immutable execution commitments, exclusions and reconstruction pointers. Complete fixed-order reports are in Appendices E, G, I and J. The anonymous inspection supplement supplies the original confirmation blocks and Skill packages, Study K treatment packages, frozen specifications and reports, with a hash manifest and an offline integrity checker. It is an inspection package, not turnkey replication or a public release: raw trajectories, excluded epochs and upstream corpora are absent, and component-specific reconstruction and rights conditions remain. All excluded studies stay outside the claims; no scientific intake or analysis was repeated for this revision. The manuscript source and self-contained LaTeX are supplied separately from the experimental inspection package.

ETHICS STATEMENT

The experiment involves no human participants and collects no human-subject data. Earlier retained studies execute agents inside fresh benchmark containers; the excluded v11 epoch, both separate Study J banks, and Study K used fresh Seatbelt-confined host-native workspaces with separate ephemeral Codex homes. Both delivery paths disable task and shell network access during retained execution, and no external account, service, or real-world system is modified. Personal contact fields present in upstream benchmark metadata are not scientific variables and will be excluded from release artifacts. The controlled family specifications, Skills, and task instances were AI-authored and are described as such; mechanical qualification does not make them independent human or domain-expert evidence. The work evaluates procedural guidance and does not authorize autonomous deployment of a Skill in a consequential environment.

AI-USE STATEMENT

OpenAI Codex agents were used in literature organization, hypothesis refinement, protocol and task development, controlled Skill authoring, implementation, experimental execution, analysis tooling, interpretation of reported results, figure generation, and manuscript drafting and revision. The study treats agent-produced artifacts as research materials, not independent human judgment. Outcome firewalls, prospective freezes, executable verifiers, immutable evidence, and explicit failed gates constrain where AI-generated reasoning could otherwise introduce confirmation bias. Human authors remain responsible for the study design, claims, disclosures, and final submission.

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APPENDIX GUIDE

Appendices A–H contain extended context, methods and supporting reports. Appendices I–J retain the exhaustive fixed-order confirmation reports. The links below give the printed page numbers for selective lookup.

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APPENDIX A. EXTENDED RELATED WORK

A.1 REUSABLE LANGUAGE AS AGENT MEMORY

Agent Skills extend a broader family of language-mediated memory and guidance. Reflexion stores verbal feedback from earlier attempts; ExpeL extracts reusable lessons from experience; AutoGuide generates and retrieves context-aware guidelines; AutoManual learns instruction manuals through environmental interaction; and Buffer of Thoughts retrieves reusable reasoning templates (Shinn et al., 2023; Zhao et al., 2024; Fu et al., 2024; Chen et al., 2024; Yang et al., 2024). These systems show that external language can alter agent behavior without weight updates. They generally couple experience collection, generation, selection, and consumption, however, so they do not identify the marginal contribution of an independently packaged Skill.

Current Skill specifications make that distinction important. A Skill is a folder-level object with a required `SKILL.md` and optional scripts, references, and assets, often loaded progressively rather than pasted as one static prompt (Agent Skills project, n.d.; Anthropic, 2026; OpenAI, n.d.). Similar procedural information can also be exposed as repository instructions (GitHub, n.d.). Package representation, activation, semantic content, and functional resources are therefore different candidate causes. Large-scale ecosystem audits add a complementary authoring boundary: public Skills exhibit substantial intent-level redundancy and frequent routing, actionability, and resource-organization defects, with routing-metadata defects associated with lower retrieval in a BM25 stress test (Ling et al., 2026; Zhang et al., 2026). Those audits establish that package quality and reuse are practical problems. GitSkills separately catalogs 3,797,117 public file occurrences and 1,877,981 distinct content hashes, establishing the scale of copying and propagation without measuring causal utility (Destefanis et al., 2026). None of these ecosystem studies identifies the marginal causal value of task-relevant content after a package is successfully delivered.

A.2 FROM AVERAGE UTILITY TO CONDITIONAL EFFECTS

SkillsBench evaluates curated Skills over a broad task inventory and reports substantial but heterogeneous aggregate gains (X. Li et al., 2026). The benchmark establishes that Skills can add capability, but its efficacy-enriched task inventory does not estimate ecosystem prevalence. SWE-Skills-Bench instead reports substantial redundancy and negative cases in software-engineering settings (T. Han et al., 2026). Work on realistic Skill use, retrieval augmentation, presentation granularity, selective invocation, and epistemic gating decomposes additional pipeline failures (Y. Liu et al., 2026; Su et al., 2026; Chen et al., 2026a; Xu and Wu, 2026b; Unlu, 2026). These studies motivate conditional evaluation, but pipeline-level success does not localize causal content.

Several studies directly estimate heterogeneity or diagnose regressions. *Not All Skills Help* randomizes the inclusion of generated library members to estimate Skill–task marginal effects (Wang et al., 2026). *The Regression Tax* uses paired trajectories to distinguish gains, regressions, and residual failures and proposes skill-description osmosis, grounding displacement, and verification displacement as candidate regression mechanisms (Tank and Nama, 2026). *Agent Skills Can Be Harmful* constructs 307 selected target/reference functional failures and cost regressions, then codes implementation, environment, artifact-placement, and excessive-procedure causes from paired evidence (Dong et al., 2026). These studies locate harmful regimes and plausible trajectory causes, but they do not manipulate the proposition supplied by an intact Skill or whether ordinary task evidence already resolves that proposition. Our target is complementary: first identify a whole-package regime with controlled exposure, then reserve mechanism language for a content or resource intervention.

A.3 ATTRIBUTION, SCAFFOLD CONTROLS, AND DELIVERY

The closest work already goes well beyond unpaired endpoint comparison. Skill Theater intervenes on meaning, wording, identity, assignment, and communication in controlled decision tasks (Hu et al., 2026). Counterfactual Trace Auditing aligns Skill and no-Skill trajectories and labels influence patterns (Zhou et al., 2026). Workflow-local mechanism learning and CausalFlow localize or replace candidate failure steps (Lin et al., 2026; Bonagiri et al., 2026), while component ablation tests sections of generated Skills (Huang, 2026). These methods provide valuable discovery signals, but trace differences, optimizer success, and deletion of generated sections do not by themselves establish the necessity of a proposition in an intact reusable package under matched accessible information.

Demystifying Agent Skills holds source trajectories fixed while comparing direct workflow-memory representations with distilled Skills, and its paired trajectory taxonomy finds procedural anchoring far more often than explicit knowledge injection (Jiang et al., 2026). This establishes an important representation and behavioral boundary. It does not intervene on a proposed causal proposition inside an intact package or jointly randomize whether ordinary task evidence resolves that proposition; its mechanism labels remain post-treatment trajectory interpretations.

Two findings make matched controls load-bearing. *Scaffold, Not Vocabulary?* uses a preregistered ablation ladder, labels-only scaffold, length-matched placebo and anti-Skill conditions, with execution tests for a subset of arms. In its tested settings, full procedural content shows no separable execution-correctness benefit beyond the labels-only scaffold (Iscan, 2026). A controlled real-cost decomposition finds no established efficiency gain from shortening, structure, or scoped loading, while a stronger executor improves success at substantially higher monetary cost (Xu and Wu, 2026a). In structured function calling, canonicalized rescoring and format-only controls separate interface alignment from procedural transfer (Chen et al., 2026b). These papers preclude claims of the first component ablation or matched placebo. They also sharpen the remaining question: whether task-relevant content in intact packages changes hidden, state-based outcomes beyond a harmless package-shaped control.

Concurrent preprints narrow the attribution and authoring space further. SkillSV and SkillShapley assign Shapley-style value to units or ordered steps of a fixed Skill under fixed tasks, using structure-respecting deletion and length-neutral padding or budgeted cache-aware coalition sampling (T. Li et al., 2026; C. Liu et al., 2026). SkillEval learns interpretable document-level directions for properties such as trigger clarity, technical specificity, workflow integrity, and failure awareness, then uses those signals to guide revision (J. Han et al., 2026). Skill Coverage translates source instructions into observable behavior constraints and judges whether trajectories expose enough evidence to evaluate them, without equating coverage with success (Tan et al., 2026). SkillHEX turns falsifiable failure hypotheses into executable diagnostic tests during branch-based Skill evolution (Feng et al., 2026), while SkillProx couples outcome-checked textual updates with a frozen leave-one-out audit and validation-gated consolidation (Zheng et al., 2026). These works occupy generic unit valuation, intrinsic quality scoring, trajectory test adequacy, and outcome-guided diagnosis or optimization. They do not randomize whether ordinary task evidence already resolves the same consequential choices as exact Skill content, which is the conditional mechanism tested here.

Delivery and faithful reliance form a second boundary. Cue-triggered injection can differ from voluntary memory storage (Saha, 2026), and long-context use depends on information position (N. Liu et al., 2024). Condensed experience can improve performance even when corrupt or irrelevant variants retain much of the effect (Zhao et al., 2026). We therefore define treatment by assigned package exposure, verify delivery separately, and do not condition causal contrasts on self-reported invocation or observed post-treatment access.

A.4 Gap and contribution boundary

Prior work already occupies whole-Skill effects, paired trajectory diagnosis, component ablation, matched scaffold and interface controls, internal-unit valuation, quality metrics, and outcome-guided revision (Wang et al., 2026; Tank and Nama, 2026; Chen et al., 2026b; Jiang et al., 2026; Dong et al., 2026; T. Li et al., 2026; C. Liu et al., 2026; J. Han et al., 2026; Tan et al., 2026; Zheng et al., 2026). We do not claim these as firsts.

More recent work reinforces the distinction between knowledge and delivery. Piriyakulkij et al. (2026) compare executing packages in the main context with executing them as subagents, finding that procedural input-output contracts matter to this comparison. Their synthesized-versus-curated package comparison also changes content; it does not isolate a particular convention proposition. Kassis et al. (2026) catalog scientific procedures but explicitly report no task-level evaluation. Neither establishes the marginal causal value of a particular instruction. These are complementary boundaries, not evidence for our own treatment effects.

Our core identification result is narrower: a randomized intervention on one oracle-aligned convention, followed by a documentation-by-content factorial whose large pooled gain did not satisfy its registered family-recurrence rule. Documentation omission, a current explicit note, and an incompatible note are the manipulated conditions. We did not obtain evidence for a graded task-diagnosticity

moderator, a general rule predicting the two zero-effect families, or prospective authoring value. The finite-bank evidence is useful because it shows concretely how a local causal explanation and a large average can coexist with an unlicensed broader claim; it does not establish why that pattern must recur in other families. The separate information-source and carrier studies add tests of those broader interpretations, without turning the local result into a recurrence or authoring claim.

A.5 Rule induction, explicit guidance and observable success

In-context learning has a latent-inference account under specific generative assumptions: Xie et al. (2022) analyze a mixture-of-hidden-Markov-model pretraining distribution. That conditional account does not establish the internal algorithm of the agent studied here. Instruction induction instead makes a task description an explicit output and tests its downstream execution (Honovich et al., 2023). Hypothesis Search separates candidate descriptions from program implementation and verification (Wang et al., 2024). Neither explicit instructions nor their executable evaluation are new contribution objects in this paper.

Demonstrations can also support performance through factors other than the correct input-output relation. Min et al. (2022) find limited average damage from randomized labels in their classification and multiple-choice setting; Yoo et al. (2022) show that sensitivity varies with experimental configuration, including templates and model size. These results constrain generalization; they do not establish whether the present agent uses our identifying examples. We neither equate logical recoverability with actual use nor infer that example correctness is universally unimportant.

Finally, a correct answer need not reveal a correctly recovered general rule. Honovich et al. (2023) describe cases where the execution model compensates for an imperfect instruction. Parab et al. (2025), a preprint, identify a related single-test-example limitation in hypothesis-search evaluation. Study J therefore measures the effect of the assigned evidence and Skill on a fixed executable target. Its two-rule identification proof is about the accessible information, not a proof of the agent's internal induction or generalization to untested inputs. The completed development and operational reports remain separate: the former calibrates the contrast, while the latter leaves its direction unresolved. Any subsequent transfer claim requires new evidence.

Appendix B. Identification and measurement details

B.1 Question, unit, and causal contrasts

We study a deliberately narrower question than whether a model "uses" a Skill: does controlled exposure to a reusable Skill package change an externally verified task outcome? The scientific unit is a task–Skill pair under a fixed model, task image, host epoch, and delivery implementation. For pair i, let $Y_i \in \{0, 1\}$ indicate full success under the task's hidden deterministic verifier. We randomize rollouts among three conditions:

- **C0 (no target Skill):** the target package, its metadata, and its resources are absent;
- **C1 (original Skill):** the exact pinned benchmark-native package is exposed under a controlled wrapper; and
- **C2 (matched placebo):** the same wrapper and package shape expose one of two independently written, outcome-irrelevant placebo variants.

The registered pair-level intention-to-treat contrasts are

$$\Delta_i^{10} = E[Y_i \mid C1] - E[Y_i \mid C0],$$
$$\Delta_i^{12} = E[Y_i \mid C1] - E[Y_i \mid C2],$$
$$\Delta_i^{20} = E[Y_i \mid C2] - E[Y_i \mid C0].$$

The first asks whether the whole Skill package changes success relative to no target package. The second separates task-relevant package content from generic Skill-shaped context, attention, and interface effects. The third measures that generic context effect directly. C2 is one arm: its A/B variants are balanced replicates, not separately estimated treatments. Assignment, rather than self-reported invocation or apparent reliance, defines exposure throughout.

B.2 Outcome-blind task selection

We pinned the SkillsBench source at commit `9a1f4dd5f7659f75707435da3ce854b6e48321d1` before experimental outcomes. Task selection used only source metadata, static provenance and licensing evidence, package structure, task interface, dependency requirements, and the structure of the oracle and verifier. It excluded prior treatment scores, leaderboard directions, new model rollouts, and oracle/verifier outcomes during ranking. Candidates were ordered by a deterministic coverage rule favoring new benchmark categories, package classes, module-count balance, and interfaces, followed by lower reconstruction burden and a hash-based tie break.

After this order was frozen, a candidate could be excluded only for a predeclared measurement or feasibility failure: unsafe or unresolved code, unavailable condition-invariant dependencies, answer leakage, an ambiguous endpoint, or a verifier that accepted registered plausible-wrong artifacts. Dynamic checks could exclude a candidate but could not reorder passing tasks on the basis of an expected Skill effect. The immediate identification pilot uses the first three fully admitted pairs spanning three categories. This is a purposive feasibility roster, not a probability sample; it licenses pair-level claims and next-stage design decisions, not a benchmark-wide mean or prevalence claim.

B.3 Treatment construction

Across arms we hold fixed the task prompt, controller cue, wrapper location, task files and image, model and reasoning level, permissions, timeout, network policy, and host epoch. C1 preserves every registered module and resource byte from the pinned package. C0 exposes no target-Skill name, metadata, body, reference, script, asset, or shared root file.

Each pair has two independently authored C2 packages. For every C1 module, its C2 counterpart matches visible-prose token count within $\pm 5\%$, heading depth, imperative style, formatting, broad domain vocabulary, module count, and path pattern. A proposition map enumerates the answer-relevant facts, procedures, formulas, parameters, examples, resource pointers, and verifier implications that C2 must omit. Placebos must also avoid false operational advice or instructions to ignore the task. Separate blinded reviews check structural matching, irrelevance, harmlessness, and textual leakage before activation. When C1 contains a functional resource, C2 matches the wrapper rather than pretending that an inert file is a functional equivalent; consequently C1–C2 remains a whole-package-content contrast, not a pure prose-semantic contrast.

B.4 Execution, randomization, and replication

Rollouts use Codex CLI 0.144.5 with `gpt-5.6-terra` at medium reasoning. Each rollout receives a history-free thread under the same frozen configuration and a freshly created task container. Task and shell network access are denied after condition-invariant dependencies are pinned; ACP model transport uses the same declared host proxy in every arm. The task-specific wall-time limit is 30 minutes in every arm; agent-caused timeout or noncompletion is an outcome. Within each initial block, all nine pair–condition cells enter the task-prompt window concurrently. Every cell has a distinct working root, configuration, Compose project, container namespace, session, and evidence destination; same-task cells therefore share no mutable image, volume, process, or cleanup scope. Pre-prompt container and ACP initialization may be serialized for host stability, but a wave is released only after all nine cells pass the common readiness gate. After an agent terminates, its event stream and final task state are hardened before the cell enters a host-level trusted-verifier queue. At most one trusted verifier runs at a time, and queueing time is excluded from both the registered agent and verifier measurement windows.

Before outcomes, we generate a blocked assignment with HMAC-SHA256 using the literal registered seed `skillsbench-sentinel-v1-2026-08-01-stage-correction`. Four initial blocks assign one C0, C1, and C2 rollout per pair, with C2 balanced 2A/2B. Conditions and pairs are interleaved over clock time, and agent-, schedule-, and verifier-facing labels use opaque run identifiers rather than condition names. Two additional blocks per arm are frozen but sealed. They open for a pair only if, after all 12 initial valid-start rollouts are locked, at least one arm varies in full success or total clause score. If triggered, all three arms receive exactly two further rollouts and C2 adds one A and one B run; otherwise no arm is extended. This symmetric rule is not a significance-based stopping rule.

Retries are restricted to registered infrastructure events. A verified pre-agent launch failure is not a valid start; corrupted event capture and a verifier-process crash are valid but unscorable starts. Each may be retried only with the failed immutable attempt and retry parent preserved. Agent command errors, dependency misuse, invalid output, timeout, treatment-caused crashes, and ordinary task failure are outcomes and are never retried.

B.5 Measurement and analysis

The primary endpoint is binary full success: every mandatory clause from the deterministic verifier, hidden from the agent during its turn, must pass on a frozen final artifact. Prespecified secondary records are the mandatory and optional clause outcomes, timeout status, and registered failure class. Raw event streams and final diffs can support exploratory descriptions of observable tool calls, edited files, or validation attempts when those facts are recoverable; duration, token/cache use, resource access, and severe violations are not treated as normalized endpoints in this pilot. Clause roles and the complete clause set are frozen per pair and must be identical across arms. Natural-language rationales and self-reported Skill use are descriptive only, and we never condition the analysis on post-treatment invocation, resource access, or apparent compliance.

For each pair and arm we report every run, the success count, empirical success rate, and clause-level counts. At the selected $n = 4$ or $n = 6$ look, arm uncertainty uses a two-sided Clopper–Pearson interval with error 0.025, which is Bonferroni-safe over the two registered looks. Simultaneous 95% bounds for the three risk differences are formed from arm–look intervals with error $0.05/6$, transforming $[L_A, U_A]$ and $[L_B, U_B]$ to $[L_A - U_B, U_A - L_B]$ and clipping to $[-1, 1]$. The pilot reports no randomization p-value and no confirmatory pooled cross-pair statistic.

B.6 Evidence and contamination controls

All adaptive design choices and analysis code are frozen before retained outcomes. The initial activation manifest hash-binds the protocol, source snapshot, outcome-blind roster and exclusions, task/verifier validation, C0/C1/C2 bytes, placebo reviews, runtime and permission boundary, assignment, retry policy, run schema, and analysis implementation. Non-scientific lifecycle fixtures must demonstrate condition-exact delivery, fresh state, absence of cross-run file, process, environment, marker, and session carriers, hidden-material and task/shell-network denial, agent termination before verification, write-once hash-bound event/file-diff capture, and scoring by a separate trusted verifier. Each retained attempt then records its opaque assignment, hash-bound execution plan and artifacts, raw event stream, final file diff, verifier record, failure class, and retry ancestry; the activation manifest separately pins the implementation bytes. These controls distinguish an agent outcome from a delivery, infrastructure, capture, or scoring failure without inspecting or selectively dismissing unfavorable task results.

The registered variation assessor reads only the four initial outcomes per arm needed by the symmetric extension rule and emits a hash-bound authorization decision without an arm mean or treatment contrast. A separate extension activation binds that decision, the sealed initial index, and the exact frozen block-5/block-6 run identifiers before any extension run. Extension attempts use the same task, treatment, model, timeout, isolation, lifecycle capture, and normalization code; their separate immutable index is admitted only as a complete authorized set. Final collection revalidates the initial index with the frozen v1.4 normalizer, validates all extension sources, and requires the pre-frozen analyzer to accept the combined schedule before writing a ledger.

B.7 Registered convention definitions

The five conventions are deliberately different. Business-day records require conversion to `America/Chicago`, a 04:00 local boundary, left-closed/right-open intervals, and void exclusion rather than UTC calendar buckets. Layered configuration uses recursive object merge, array replacement, an explicit `$delete` marker, and value-preserving JSON `null` rather than concatenation and delete-like nulls. Artifact fingerprints use recursive Unicode NFC normalization, compact normalized-key JSON, and a domain-separated SHA-256 preimage rather than ordinary sorted JSON. Release selection uses frozen numeric/prerelease precedence, stable-channel admission, and

a build-metadata tie rule rather than lexicographic precedence. Settlement totals use exact decimal arithmetic and per-line half-even cent rounding rather than aggregate-first half-up rounding.

B.8 One inspectable confirmation block

This example comes from the already retained five-family confirmation bank (business-day records, block b4fa8f3344d5). It was selected by inspecting frozen materials, not agent outputs; it is illustrative and contributes no new observation or subgroup estimate. The three documentation variants share the same 15-record synthetic input and task body. The three Skill packages can be crossed with any documentation variant, giving the nine registered cells. This displays the agent-visible intervention and the verifier-sensitive answer without reproducing any upstream benchmark asset. The exact local task-variant identifiers are t39d74331f2d (D0), te900ae251c0 (D1), and t03daf15ef1d (D2); package identifiers are p208090fb865 (S0), p5b5c4c8e12f (S1), and pa913771b43b (S2). The identifiers are provenance, not a public artifact release or a substitute for independent reproduction.

The controlled task header fixes an offline, no-network Python environment, a 30-minute agent timeout, and a test-script verifier. The shared task body is reproduced verbatim in every D variant:

> You are completing an offline transaction ledger reconciliation task. Read `/root/task_input/input.json` and `/root/task_input/operator_note.md`. The input states the active environment profile. Treat an operator note for another profile as compatibility context rather than an authoritative current rule. If exact current convention information is unavailable, use your best operational judgment. Use the assigned `convention-operator` module guidance when present and reconcile its applicability with the active profile.
>
> Aggregate the transaction events into business-day buckets. Return exactly these top-level fields:
>
> - `dataset_id`: copy the input dataset identifier.
> - `source_record_count`: number of source event records.
> - `business_days`: sorted by business date then currency. Each entry has `business_date`, `currency`, `event_count`, lexicographically sorted `event_ids`, and two-decimal `net_amount`.
> - `accepted_event_count`, `void_event_count`, and two-decimal `accepted_net_amount`.
>
> Write one strict UTF-8 JSON object to `/root/answer.json`. Do not modify the read-only inputs or create outputs elsewhere. Do not make network requests.

The identical input across D0/D1/D2 has dataset_id d624c02056fb and active profile LedgerDesk ledger-v2. The complete source records, in input order, are:

Table 5: Inspectable ledger block: the 15 input events, in source order.

Event ID	UTC instant	Currency	Amount	Status
eda5983f466c	2026-01-15T10:17:00Z	CAD	12.45	posted
e656ef4749f6	2026-01-14T09:59:00Z	USD	12.45	posted
ee172a7a9604	2026-01-14T10:17:00Z	USD	7.25	posted
ed2c47ea4e69	2026-01-15T05:35:00Z	CAD	40.00	posted
e28bd0b0721f	2026-01-16T09:59:00Z	USD	12.45	posted
eeb8556c8a49	2026-01-16T11:20:00Z	USD	18.90	void
e644e46e2ecd	2026-01-14T11:20:00Z	USD	0.55	void
e9b7096c951a	2026-01-14T10:00:00Z	USD	40.00	posted
ef4948aee11a	2026-01-16T05:35:00Z	USD	0.55	posted
e7402d61431e	2026-01-15T11:20:00Z	USD	-3.10	void
ebf8c34e9b58	2026-01-17T05:35:00Z	USD	18.90	posted
ebcf210b8a61	2026-01-15T10:00:00Z	USD	12.45	posted
e494b2c3b2a5	2026-01-16T10:17:00Z	USD	12.45	posted

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Table 5 (continued): Inspectable ledger block: the 15 input events, in source order.

Event ID	UTC instant	Currency	Amount	Status
e00a059f8d96	2026-01-16T10:00:00Z	CAD	-3.10	posted
ef2280c40930	2026-01-15T09:59:00Z	USD	0.55	posted

Each operator note has the heading "Operator runbook", status "retained operator guidance", and this identical output-discipline paragraph: "Read the complete input before computing. Preserve identifiers exactly, use only Python's offline standard library, and write one strict JSON object at the requested output path." The condition-specific sections are:

Table 6: Inspectable ledger block: all three ordinary-documentation conditions.

Note	Compatibility scope	Convention text	Worked-rule text
D0	ledger unversioned	Use the environment profile to identify the applicable business-zone, cutoff, interval-boundary, and record-status policy before assigning ledger buckets.	Events on opposite sides of the applicable cutoff belong to adjacent business buckets; verify the profile before choosing the boundary.
D1	ledger-v2	For LedgerDesk ledger-v2, convert each UTC event instant to America/Chicago, assign the business date at a 04:00 local cutoff using left-closed/right-open intervals, and exclude records whose status is void.	An event at 04:00 America/Chicago begins that local business date; one immediately before 04:00 belongs to the preceding business date.
D2	ledger-v1	For LedgerDesk ledger-v1, keep each event in UTC and assign it to the UTC calendar date at a 00:00 cutoff using left-closed/right-open intervals; records whose status is void remain excluded.	An event at 00:00 UTC begins that UTC calendar date; one immediately before 00:00 belongs to the preceding UTC calendar date.

Each package supplies a module named convention-operator, with the same description ("Apply the profile-aware transaction ledger reconciliation workflow to local inputs and write the required JSON artifact") and CC-BY-4.0 license line. Its shared "Inputs and output" paragraph reads: "Read both the local JSON input and operator note before computing. Preserve input identifiers, obey the requested output schema, and write only the requested final JSON artifact." Its shared procedure is: (1) "Confirm the active environment profile and the convention's applicability"; (2) "Parse every source record with exact string, integer, and decimal semantics where relevant"; (3) "Apply the convention consistently across the complete input rather than record by record guesswork"; and (4) "Sort every collection deterministically and serialize one strict UTF-8 JSON object." Its shared validation paragraph reads: "Re-read the result, verify required keys and counts, reject non-finite values, and confirm that the read-only inputs remain unchanged. Do not infer a hidden expected answer." The full condition-distinguishing package text is:

Table 7: Inspectable ledger block: all three Skill conditions.

Skill	Applicability text	Convention text	Boundary-check text
S0	This workflow is profile-sensitive. Read the active environment profile and use only a convention whose applicability is established for that profile.	Use the environment profile to identify the applicable business-zone, cutoff, interval-boundary, and record-status policy before assigning ledger buckets.	Events on opposite sides of the applicable cutoff belong to adjacent business buckets; verify the profile before choosing the boundary.
S1	This workflow is registered for ledger-v2. Confirm that exact active profile before applying the convention below.	For LedgerDesk ledger-v2, convert each UTC event instant to America/Chicago, assign the business date at a 04:00 local cutoff using left-closed/right-open intervals, and exclude records whose status is void.	An event at 04:00 America/Chicago begins that local business date; one immediately before 04:00 belongs to the preceding business date.
S2	This workflow is registered for ledger-v1. Confirm that exact active profile before applying the convention below.	For LedgerDesk ledger-v1, keep each event in UTC and assign it to the UTC calendar date at a 00:00 cutoff using left-closed/right-open intervals; records whose status is void remain excluded.	An event at 00:00 UTC begins that UTC calendar date; one immediately before 00:00 belongs to the preceding UTC calendar date.

The trusted oracle for this block requires dataset_id d624c02056fb, source_record_count 15, accepted_event_count 12, void_event_count 3, and accepted_net_amount "166.40". Its convention-sensitive business_days array must equal the following sorted rows; every event_ids list is sorted:

Table 8: Inspectable ledger block: the complete expected business-day rows.

Business date	Currency	Event count	Event IDs	Net amount
2026-01-13	USD	1	e656ef4749f6	12.45
2026-01-14	CAD	1	ed2c47ea4e69	40.00
2026-01-14	USD	3	e9b7096c951a, ee172a7a9604, ef2280c40930	47.80
2026-01-15	CAD	1	eda5983f466c	12.45
2026-01-15	USD	3	e28bd0b0721f, ebcf210b8a61, ef4948aee11a	25.45
2026-01-16	CAD	1	e00a059f8d96	-3.10
2026-01-16	USD	2	e494b2c3b2a5, ebf8c34e9b58	31.35

The primary convention clause compares the complete business_days value with this oracle; separate mandatory clauses check strict output schema, the nonfocal fields above, and unchanged public inputs. This example exposes the material contrast but does not establish that one carrier is generally better: D1 and S1 both disclose the same current convention, whereas D2 and S2 deliberately refer to a different profile.

B.9 Exact local intervention assignment and inference

The 54-opportunity intervention uses six nine-slot waves, each containing all six conditions once and three a second time. Let A–F denote the lexicographically sorted frozen opaque condition IDs, not outcome-ranked arms. The duplicate rotation is ABC, DEF, ADE, BCF, ACE, BDF; thus each condition appears nine times. Within each wave, HMAC-SHA256 ranks condition-occurrence slots before responses. This is distinct from the pilot's extension rule.

For a focal positive/negative pair, let their frozen multiplicities in wave w be $a_w, b_w \in \{1, 2\}$. Hold other labels fixed and enumerate all $\binom{a_w+b_w}{a_w}$ allocations of positive labels among those focal slots. Take the Cartesian product over six waves, with equal weight per allocation. The statistic is the positive-minus-negative total success count divided by nine. The one-sided exact p is the fraction of enumerated statistics at least as large as observed, with no plus-one correction. The three tests in Section 3.2 enumerate 729, 1,296 and 729 assignments, respectively; Holm covers exactly these three. Exactness concerns the sharp null under the assignment and no-interference assumptions, not a heterogeneous-average null.

The six-arm uncertainty construction uses two-sided Clopper–Pearson intervals at per-arm error 0.05/6, then subtracts the negative arm's upper bound from the positive arm's lower bound, and conversely for the upper difference bound. These conservative bounds are not equivalence tests. This specification is transcribed from the frozen local protocol and analyzer; neither was rerun.

B.10 Original five-family bootstrap recipe

Each of 200,000 replicates samples six complete nine-cell instance blocks with replacement independently within each of the five fixed families. The same sampled blocks feed all four primary contrasts. Their family means are then equally weighted; no family is resampled as a population draw. The frozen SplitMix64 stream uses unbiased rejection sampling for bounded integers and seed 3593608783428413020, derived from `controlled-convention-gap-confirmation-v1-family-stratified-bootstrap`.

Ordinary intervals use nearest-rank 0.025 and 0.975 quantiles of each replicate contrast. For simultaneous intervals, each replicate contributes the maximum absolute deviation from the original point estimate across the four primary contrasts. Its nearest-rank 0.95 quantile is one common symmetric radius; endpoints are clipped to [-1,1]. These are approximate conditional bootstrap summaries, not population intervals over new families or replacements for the sharp-null tests. Appendix E retains the original outputs unchanged.

B.11 Questions, evidence units and conclusions

The evidence-unit map below separates repeated opportunities from the unit over which a scientific claim might recur. Hidden items are nested scoring components, not extra independent rules. No row licenses a population claim.

Table 9: Questions, evidence units, and supported conclusions across the retained studies.

Study and question	**Fixed settings**	**Repeated opportunities**	**Supported conclusion and boundary**
Pilot: where might content matter?	3 selected benchmark pairs	54 rollouts	Exploratory localization, not recurrence.
Local: does the exact convention matter?	1 earthquake task	54 rollouts; 6 conditions	Local causal convention effect, not transport.
Factorial: do gains recur?	5 constructed families	30 nine-cell blocks	Finite-bank gain; recurrence gate fails.

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Table 9 (continued): Questions, evidence units, and supported conclusions across the retained studies.

Study and question	Fixed settings	Repeated opportunities	Supported conclusion and boundary
J: does identifiability attenuate gain?	4 development families; separate 8-workflow confirmation	72 development cells; 128 nine-cell confirmation waves	Development pattern; independent direction unresolved. Banks are not pooled.
K: source information or carrier?	8 external rule lineages; constructed tasks	384 four-cell blocks; 16 nested items per task	Source gate fails; only broad-margin carrier equivalence on this fixed panel.

B.12 Complete prospective Study K claim rules

For source information (N/E minus N/N), a positive finite-panel claim requires the simultaneous all-eight lower bound above zero **and** strictly positive family points in all four prespecified no-direct-oracle lineages. Harm requires the all-eight upper bound below zero. Otherwise the classification is unresolved; a positive pooled point alone does not establish recurrence.

Carrier (N/E minus E/N) rules apply in this order: (1) an interval wholly inside [-0.25,0.25] gives broad no-material-difference; (2) otherwise, a positive lower bound and at least seven of eight positive family points give advantage; (3) otherwise, a negative upper bound and at least seven negative family points give disadvantage; (4) otherwise, unresolved or heterogeneous. The ±0.25 margin was fixed before responses and corresponds to four of sixteen equally weighted hidden items. It is not a user-utility tolerance or proof of equality. It cannot exclude differences near 0.15 or establish naturalistic retrieval equivalence. These are the original rules, not revised post-outcome gates.

B.13 Execution commitments and artifact access

The reproducibility unit is an immutable attempt source, not a mutable working directory. Separate activation manifests and locked ledgers bind all 54 pilot, 54 local-intervention, and 270 five-family confirmation outcomes. They record assignment, task and treatment hashes, model/runtime, execution plan, raw event capture, final artifacts, trusted verifier, failure classification, and analysis. Collectors reject missing, extra, changed, or unauthorized inputs; the retained five-family analyzer was invoked once on its complete 270-source ledger. Earlier unregistered development runs remain outside the retained estimates. Figure 2 is generated directly from the frozen 270-run analysis at SHA-256 `eea19f6b14ef0d689c5b4fe465cf609b6abd1df85df448de3bdc66cc4eca46a9`; its plotted values are unchanged by typesetting or manuscript revision. Study J's separately frozen 72-cell development report remains distinct from the earlier studies and from its operational confirmation.

All Study G v1 and v3–v11 epochs remain excluded; v2 never launched. They may not be resumed, replayed, collected, analyzed, merged, or substituted into another experiment. The preserved 171-wave v11 prefix is unopened operational provenance. Its exclusion receipt is SHA-256 `31fac510f01323c8bb55556f4c940658df4c07cdb1aeff225698a57b522100b9`. No Study H or I outcome exists.

Study J's exact eight-wave terminal commitment and retired sole owner were verified against its launch manifest before the permanent single-intake lock. Its complete-intake receipt is SHA-256 `ffa59cfc16d20441a177d1b6ced9e9499d698563c23653f2c043ce1095bd0a85`; the immutable summary is `424c5462d6fa7fd92e93a3ba8d00b91af5563b2ffd355061c14010f6c3e69140`. All fixed cells, contrasts, failures and resource totals appear in Appendix G. The summary-to-table renderer was frozen and qualified on synthetic fixtures before this intake. Raw trajectories were hash-verified without interpretation; no second intake, alternative analyzer or excluded-epoch import was performed.

The separately frozen operational confirmation completed exactly 128 sealed nine-cell waves and retired its sole owner with exit zero. Terminal SHA-256 is `351df56ec78110d47358ba1a6be91d2e21aa35856aed2aa4bb9569e2cf5f6aed`. Its permanent single intake was consumed once; receipt SHA-256 is `acf11d8e38e341b06b9aeae5d922c6e104cfdcbb2b201868a8fbb78833ee5a2e` and bound summary SHA-256 is `257503fbdd4e97d19f58b0edf86ede9cf7cb8879484926a17ffee5a521a058b4`. The prospectively frozen presentation includes every planned cell, stratum, contrast, dependent target, failure category and resource field in Section 4.5 and Appendix I. This report is separate from the development bank and earlier 378 rollouts. The intake is permanently consumed: no second look, raw trajectory interpretation, or excluded-epoch import is used.

Study K's eight source-rule lineages and 32 matched treatment packages were admitted before the assignment seed. Its frozen manifest SHA-256 is `7c999ca81f17a4cd738b382b0c8914b75459178f23e583e3dd5d1888d31f947c`. The internal reconstruction chain begins at `artifacts/phase1/workstreams/study_k_external_rules_v1/protocol_stage1.md` and its adjacent `stage1_frozen_manifest.json`; these bind source receipts, matched cards, the trusted bank digest, runtime and analyzer. Exactly 384 four-cell waves sealed; the sole owner exited zero, and an absent- owner check preceded the exclusive one-look intake. The terminal marker is SHA-256 `0332ba638e29d2461bc3b1116b7a6df2db1688f4a0518132caa369519443bfc5`; the receipt binds all 1,536 opportunities to report SHA-256 `0da35a94206333902f4fa2ba8f65b23950562b755e7c91218ed26aebecc30996`. The intake lock is permanent. The frozen renderer reports every prespecified arm, family, branch, failure and contrast in Section 4.6 and Appendix J; neither selected-case inspection nor a second analysis is used.

The accompanying anonymous inspection supplement contains all 30 original confirmation blocks, 15 Skill packages, and 32 Study K treatment packages, with their frozen protocols, verifier and analysis specifications, and fixed reports. Its manifest distinguishes original hashes from anonymized copies; an offline checker verifies package integrity without scientific execution. This is an inspection package, not a turnkey replay or public release. Raw attempts, trajectories, and excluded epochs are absent. Upstream corpora are not bundled: pinned reconstruction pointers retain component-specific rights and attribution conditions, including Study K's XML restrictions. Remaining provenance is retained locally; no blanket redistribution right is asserted.

APPENDIX C. PILOT RESULTS AND EXPLORATORY LOCALIZATION

C.1 IDENTIFICATION PILOT

The retained pilot contains three task–Skill pairs admitted after the outcome-blind ranking and dynamic gates in Appendix B.2. They span distinct categories, package structures, and executable outputs (Table 10). The package class and module count describe the original C1 Skill. The mandatory-clause count includes the benchmark reward clause: for TicToc, this reward carries answer correctness in addition to the three structural checks.

Table 10: Outcome-blind pilot pairs and their hidden verifier scope.

Pair	Category and package	Required artifact	Hidden mandatory verifier scope
Earthquake plate calculation	Natural science; one-module, instruction-only Skill	`/root/answer.json` identifying the 2024 earthquake within the Pacific plate furthest from its boundary	Reward plus eight checks for file/schema, identity, place, time, magnitude, coordinates, and projected distance

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Table 10 (continued): Outcome-blind pilot pairs and their hidden verifier scope.

Pair	Category and package	Required artifact	Hidden mandatory verifier scope
Energy unit commitment	Industrial physical systems; three-module, instruction-only Skill	`/root/report.json` containing a multi-period unit-commitment schedule	Reward plus 14 checks covering schema alignment, transition logic, generator/ramp/reserve limits, demand balance, renewables, minimum up/down obligations, reported cost, and cost quality
TicToc unnecessary-abort detection	Software engineering; three-module, reference-backed Skill	`/root/unnecessary_aborts.json` listing transaction identifiers	Correctness reward plus checks for file existence, integer-array structure, and sorted uniqueness

Each pair initially contributes four runs per condition, for 36 assigned rollouts in total. The C2 arm uses two runs from each independently written placebo variant. Runs are scheduled in four balanced waves of nine, with one C0, C1, and C2 rollout for each of the three pairs in every wave. The nine cells run concurrently under disjoint per-run isolation and wave-scoped sibling settlement. The registered variation rule in Appendix B.4 fired for all three pairs. We therefore activated both sealed blocks for every pair: 18 additional rollouts, two per condition and pair, with one C2-A and one C2-B per pair. The final registered schedule contains 54 logical runs.

C.2 Pair-level outcomes

All 54 logical runs produced valid, immutable agent outcomes; the final ledger contains no separately classified infrastructure failure. Table 11 reports the registered pair-level intention-to-treat analysis. Counts are full successes out of six runs. Bracketed intervals are the registered simultaneous 95% bounds for the risk differences, obtained from Bonferroni-protected exact arm intervals over all three arms and both possible looks. These deliberately conservative bounds remain wide and include zero for every contrast.

Table 11: Pilot pair-level full successes and registered simultaneous 95% risk-difference bounds.

Pair	C0	C1	C2	C1-C0 risk difference	C1-C2 risk difference	C2-C0 risk difference
Earthquake plate calculation	0/6	4/6	0/6	+0.67 [-0.46, 0.98]	+0.67 [-0.46, 0.98]	0.00 [-0.60, 0.60]
Energy unit commitment	0/6	1/6	0/6	+0.17 [-0.60, 0.76]	+0.17 [-0.60, 0.76]	0.00 [-0.60, 0.60]
TicToc unnecessary-abort detection	0/6	0/6	1/6	0.00 [-0.60, 0.60]	-0.17 [-0.76, 0.60]	+0.17 [-0.60, 0.76]

The earthquake pair contains the clearest local Skill-specific pattern. The intact package succeeded in four of six runs, whereas neither no-Skill nor matched-placebo exposure ever achieved full success. Generic Skill-shaped context therefore did not reproduce the observed effect. The selected-look 97.5% exact arm intervals were [0.18, 0.97] for C1 and [0.00, 0.52] for both C0 and C2; their overlap and the wider simultaneous contrast bound prevent a threshold claim from this small pilot.

Clause outcomes locate the difference more sharply without changing the registered endpoint. In the four later blocks, every arm identified the same earthquake and populated its metadata, but only C1 passed the distance clause: all four C1 outputs reported 3878.27 km, while C0 and C2 reported

values between 3551.98 and 4390.92 km. Across all six runs, C0 and C2 passed the identity and metadata clauses in four and five runs, respectively, yet passed the distance clause zero times; C1 passed every clause in the same four runs. Thus the whole-package contrast is concentrated in one executable numerical bottleneck, not in locating the event or formatting the artifact.

The other pairs do not support a general uplift narrative. Energy unit commitment produced one complete C1 solution but no complete C0 or C2 solution. At the same time, its mean mandatory-clause score was lower under C1 (0.31) than under C0 (0.53) or C2 (0.49): four C1 runs produced no retained report, one passed 13/15 clauses, and one passed all 15. The package may enable a rare high-quality schedule while increasing execution fragility, but that tradeoff is exploratory rather than an identified mechanism. For TicToc, C1 and C0 both achieved 0/6 full successes and C2 achieved 1/6; the corresponding mean clause scores were 0.50, 0.50, and 0.67. The pilot therefore leaves this pair in a floor/redundancy regime rather than showing benefit from the original package.

C.3 Exploratory localization of the earthquake effect

The frozen earthquake Skill repeatedly prescribes EPSG:4087, including the point-to-boundary projection and distance sequence. The benchmark oracle uses the same CRS, while the public task asks only for "GeoPandas projections" and the hidden verifier accepts the oracle distance to +/-0.01 km. Unregistered trajectory inspection after the registered analysis found that the four successful C1 runs executed commands containing EPSG:4087; C0 and C2 used other projection or distance choices. A deterministic post-pilot audit confirmed that EPSG:4087 yields 3878.27 km, while point-centered azimuthal-equidistant and densified WGS84-geodesic calculations both yield 3551.98 km and Web Mercator yields 4152.56 km–values also produced by non-C1 agents. The endpoint therefore rewards one unstated computational convention among materially different plausible choices. Because the full-content trajectories were not part of the pilot's immutable attempt binding and were inspected after case selection, this observation nominates but does not establish a mechanism.

The resulting prospective hypothesis was deliberately specific: the observed local C1 effect is caused by supplying the oracle-aligned CRS convention, beyond generic advice to use a metric projection. We tested that hypothesis in the separately frozen removal, insertion, sham-edit, and faithful-paraphrase experiment described in Section 3.2.

Appendix D. Extended limitations

The estimands are deliberately local or finite-bank. The three benchmark-native pairs were selected outcome-blind for coverage and measurement feasibility, not sampled from SkillsBench or a public-Skill ecosystem. The five confirmation families were prospectively constructed to instantiate convention-sensitive decisions, not probability-sampled from real agent work. Their instances are independent rollout blocks but not new families, repositories, authors, or domains. Consequently, neither the large gap-addition estimate nor its exact p-value estimates ecosystem prevalence, a benchmark mean, or a distribution over future task families. In particular, our qualified packages do not estimate the prevalence or downstream cost of redundancy and packaging defects observed in large public-Skill corpora (Ling et al., 2026; Zhang et al., 2026).

The confirmation is independent of the earthquake pair in construction and outcome use, but it is still a controlled, efficacy-oriented bank. Its family specifications and treatments were AI-authored and mechanically qualified; they are not human-expert or field validation. Five family directions implement the preregistered recurrence rule, but provide too few independent settings to estimate a stable hierarchy of moderators. Failure of that rule does not statistically establish absence of recurrence. The two zero effects could reflect model priors, task details, execution salience, or ceiling behavior. Distinguishing those explanations requires new prospectively chosen families, not post hoc decomposition of the present confirmation.

The benchmark-native Skill and earthquake oracle may have been co-constructed. The removal/insertion experiment identifies a local effect of convention-and-sequence guidance under that task contract; it does not establish that EPSG:4087 is scientifically privileged or that organic Skills frequently resolve such gaps. The controlled families define a current convention unambiguously, whereas real repositories may contain partial, conflicting, versioned, or socially negotiated conven-

tions. Our failed harm and repair gates underscore that transport from a clean factorial to such settings is not automatic.

All main interventions use forced package exposure. They identify the effect of making an assigned package available under a common cue, not the probability that an agent will discover, select, load, or trust it in a large installation. Retrieval quality, progressive loading, autonomous activation, and source credibility can therefore attenuate or reverse realized value. Invocation and resource-access telemetry are retained only as post-treatment descriptions and are not used to redefine exposure.

The pilot placebo controls interface shape and prose burden more tightly than a no-Skill baseline, but it cannot isolate every component of a resource-backed package. An inert placebo cannot be functionally equivalent to a unique script, reference, or asset without restoring task-relevant information. C1–C2 is thus a whole-package-content contrast. The later convention experiments intervene more narrowly on instruction content, but do not estimate the value of scripts, assets, or other Skill components.

The initial pilot remains low-resolution: six outcomes per arm yield wide registered simultaneous intervals even for apparently large pair differences. Its energy and TicToc patterns are regime-finding observations, not confirmed mechanisms. The confirmation has much greater within-bank resolution, but its bootstrap intervals quantify variation over frozen instances within the five families; they do not supply a superpopulation interval over all possible convention families. The preregistered cross-family gate is therefore a claim rule, not an estimated population probability.

The five-family sharp-null randomization tests and within-family bootstrap summaries answer different questions. Neither the p-values nor the bootstrap intervals furnish finite-sample exact weak-null inference about heterogeneous average effects. The repair interval can exclude zero while its adjusted randomization test fails, because the procedures and multiplicity treatment differ. We preserve both outputs and the originally frozen claim rule. In particular, the secondary documentation-swap statistic is not used to establish a general causal moderator.

Study G's unopened exclusion and the never-launched Studies H and I leave diagnosticity, naturalistic transport, and prospective authoring unresolved. No outcome or cross-runtime contrast from the excluded epochs is interpreted.

Finally, rollouts within each retained experiment use a fixed Codex CLI/model, delivery implementation, and host/runtime binding. The excluded v11 attempt used a separately qualified host-native delivery path rather than the containerized implementation used by earlier retained studies, but no v11 outcome or cross-runtime contrast is interpreted. Model updates, reasoning levels, scaffolds, permission systems, and package interfaces can change both baseline capability and the marginal value of a Skill. Exact bindings support reproduction within each retained experiment, not invariance across runtimes, models, or time.

APPENDIX E. FULL REGISTERED PRIMARY CONTRASTS

Table 12 preserves the complete frozen primary summary, including ordinary within-family bootstrap intervals and all family directions. The intervals are approximate within-family summaries, not population intervals over unseen families. Exact p-values refer to the sharp null in Section 3.4; the originally frozen multiplicity family and failed gates are unchanged.

Table 12: All registered primary contrasts in the five-family confirmation. Panels retain the source field order; family differences are release / settlement / configuration / business-day / fingerprint.

(a) Estimates, intervals and adjusted tests

Registered contrast	Risk difference	Ordinary 95% interval	Simultaneous 95% interval	Holm-adjusted exact p
Gap addition: D0S1-D0S0	+0.467	[0.333, 0.600]	[0.300, 0.633]	0.000778
Correctness under gap: D0S1-D0S2	+0.633	[0.467, 0.767]	[0.467, 0.800]	0.00004196
Conflicting-Skill harm: D1S0-D1S2	+0.100	[-0.033, 0.233]	[-0.067, 0.267]	0.1875
Stale-document repair: D2S1-D2S0	+0.200	[0.067, 0.333]	[0.033, 0.367]	0.0703

(b) Family risk differences in registered order

Registered contrast	Family risk differences: release / settlement / configuration / business-day / fingerprint
Gap addition: D0S1-D0S0	0 / +0.667 / 0 / +1.000 / +0.667
Correctness under gap: D0S1-D0S2	+0.333 / +1.000 / +0.167 / +1.000 / +0.667
Conflicting-Skill harm: D1S0-D1S2	0 / 0 / 0 / 0 / +0.500
Stale-document repair: D2S1-D2S0	+0.167 / +0.167 / 0 / -0.167 / +0.833

APPENDIX F. INFORMATION-SOURCE DEVELOPMENT DESIGN AND MEASUREMENT BOUNDARY

F.1 IDENTIFICATION LEVERAGE

Study J separates *new logical information* from *usable explicit guidance*. Each of four newly constructed workflows has exactly two publicly specified candidate rules, a target with different correct outputs under those rules, and worked inputs distinct from the target. The workflows concern interval ownership, duplicate-key reconciliation, ready-job ties, and bitfield packing. Both rule orientations are used; each family's target remains fixed across orientations. Fresh construction does not establish independent human authorship or naturalistic representativeness.

E0 examples are compatible with both rules. E1 examples identify one rule without stating it. E2 retains those E1 examples and explicitly states the same rule in ordinary documentation. Each evidence state is crossed with a generic (K0), correct-rule (K1), or inverted-rule (K2) Skill, preserving the package structure and focal-choice cue. E1K1 can therefore improve performance without supplying new logical information relative to the declared candidate class. E2 is a calibration of explicitness, not proof of representation, attention, or instruction equivalence.

For paired E0K0 cells, the rule-bearing public material is identical while the two correct target outputs, a_0 and a_1, differ. For any policy whose output distribution is independent of the concealed orientation, let $p_j = \Pr(A = a_j)$. Since one submitted answer cannot equal both distinct outputs, $p_0 + p_1 \leq 1$. Equal weighting of the two orientations therefore gives expected success at most $1/2$. This is a property of the declared information experiment, not an observed model result or a finite-sample ceiling. Stochastic successes above one half alone do not establish leakage. The bound does not apply to conditions whose Skill supplies rule information.

The separating target distinguishes the two declared rules, not every possible program or shortcut that could return the same answer. Successful execution therefore does not identify a general rule

learned by the agent or establish performance on untested inputs (Appendix A.5). This measurement boundary does not authorize post-hoc extra tests, new endpoints, or changes to the completed pilot.

F.2 Frozen development evidence boundary

The pilot contains four families, two orientations per family, and all nine conditions: 72 no-retry cells in eight complete waves. Orientations and rollouts are not additional independent families. A single fixed intake requires the complete terminal set; an ambiguous unsealed pilot is excluded unopened. Before any scientific opportunity, the exact materials, opaque schedule, common prompt, model/runtime, controller, trusted verifier, intake, and descriptive reporter were bound in a separate launch manifest. Synthetic qualification establishes implementation properties, not model capability on the scientific tasks. No excluded epoch contributes materials or evidence.

Each fresh client receives only its public task, examples, assigned Skill, and common prompt. Commands are restricted to the isolated workspace and read-only runtime, with command network access denied. The parent captures trajectories and `result.json` before trusted verification outside the agent sandbox; final chat text is not scored. A valid opportunity remains an observation when it times out, fails, or produces missing or malformed output. The pinned request is `gpt-5.6-terra` with medium reasoning through Codex CLI 0.144.5 and Python 3.13.2. Unavailable server-reported model identity is disclosed as unavailable rather than inferred from the request.

Reporting retains all nine rates, all four families, failures and resource totals. With equal family weights, it reports K1−K0 and K1−K2 within each evidence state, E1K0−E0K0, E2K0−E1K0, and attenuation of the K1−K0 increment from E0 to E1 and from E1 to E2. These are descriptive development contrasts; no significance, equivalence, recurrence, general moderator, transport, or authoring claim is licensed. Logical identification by examples does not establish that the agent uses them. Any later confirmation must be frozen separately after considering the complete pilot, without absorbing these development observations or selecting favorable families.

F.3 Transfer measurement boundary

A later fixed application panel could distinguish some target-specific shortcuts from rule-consistent behavior without interpreting the agent's explanation. An outcome-free toy construction makes the distinction explicit. For $r_0(u, v) = 2u + v$ and $r_1(u, v) = u + 2v$, diagonal examples leave the rule underdetermined, while asymmetric examples identify it. A policy that sorts the operands before applying the correct formula succeeds at target $(1, 3)$ but fails at reversed inputs such as $(4, 2)$. A fixed panel containing both orderings rejects that particular shortcut. This is a mathematical counterexample, not an observed model strategy or another empirical family.

Such a panel would measure correct behavior on its specified inputs, not general rule learning. For any tested set O and untested input x^*, a function can agree with the applicable rule on O and disagree at x^*. Moreover, multiple targets sharing one binary convention do not multiply the information bound: the two correct answer vectors are distinct, so expected all-target correctness for an orientation-independent E0 policy remains at most $1/2$, not $2^{-|O|}$. Targets are dependent measurements, not additional independent families or agent opportunities.

The deterministic construction and strict output checks are retained as a candidate measurement component. They neither alter Study J's single-target endpoint nor authorize another experiment. Any adoption would require untouched, prospectively fixed probes, joint commitment before verifier feedback, retention of every outcome, explicit-rule calibration, and a separately frozen opportunity-level analysis. Added execution burden prevents pooling panel and single-target rates as though their endpoints were identical.

Appendix G. Complete Study J development report

Material class: FROZEN_DEVELOPMENT_OUTCOMES. Complete one-intake development evidence; not independent confirmation or H/I activation.

G.1 All fixed cell counts

Successes/opportunities (percent), with both orientations retained. E0 is underdetermined, E1 inferable, E2 explicit. All-family rates weight the four families equally; orientations are not independent families.

Table 13: Study J development: all fixed cell counts.

Family	Evidence	K0 generic	K1 correct	K2 inverted
All four families	E0	5/8 (62.5%)	8/8 (100.0%)	0/8 (0.0%)
All four families	E1	8/8 (100.0%)	8/8 (100.0%)	8/8 (100.0%)
All four families	E2	8/8 (100.0%)	8/8 (100.0%)	8/8 (100.0%)
Intervals	E0	1/2 (50.0%)	2/2 (100.0%)	0/2 (0.0%)
Intervals	E1	2/2 (100.0%)	2/2 (100.0%)	2/2 (100.0%)
Intervals	E2	2/2 (100.0%)	2/2 (100.0%)	2/2 (100.0%)
Records	E0	2/2 (100.0%)	2/2 (100.0%)	0/2 (0.0%)
Records	E1	2/2 (100.0%)	2/2 (100.0%)	2/2 (100.0%)
Records	E2	2/2 (100.0%)	2/2 (100.0%)	2/2 (100.0%)
Ready jobs	E0	1/2 (50.0%)	2/2 (100.0%)	0/2 (0.0%)
Ready jobs	E1	2/2 (100.0%)	2/2 (100.0%)	2/2 (100.0%)
Ready jobs	E2	2/2 (100.0%)	2/2 (100.0%)	2/2 (100.0%)
Bitfields	E0	1/2 (50.0%)	2/2 (100.0%)	0/2 (0.0%)
Bitfields	E1	2/2 (100.0%)	2/2 (100.0%)	2/2 (100.0%)
Bitfields	E2	2/2 (100.0%)	2/2 (100.0%)	2/2 (100.0%)

G.2 All registered descriptive contrasts

Exact signed rate differences, in fixed order. K1 increment denotes K1 minus K0. These are development descriptions, not significance, equivalence, recurrence or moderator tests.

Table 14: Study J development: all registered descriptive contrasts.

Contrast	All	Intervals	Records	Ready jobs	Bitfields
E0: K1 - K0	3/8	1/2	0	1/2	1/2
E0: K1 - K2	1	1	1	1	1
E1: K1 - K0	0	0	0	0	0
E1: K1 - K2	0	0	0	0	0
E2: K1 - K0	0	0	0	0	0
E2: K1 - K2	0	0	0	0	0
K0: E1 - E0	3/8	1/2	0	1/2	1/2
K0: E2 - E1	0	0	0	0	0
K1 increment: E0 - E1	3/8	1/2	0	1/2	1/2
K1 increment: E1 - E2	0	0	0	0	0

G.3 All failure categories

Every frozen failure category, including zeros. Valid failed opportunities remain in all cell denominators; no outcome is retried or excluded.

Table 15: Study J development: all failure categories.

Failure	All	Intervals	Records	Ready jobs	Bitfields
incorrect output	11	3	2	3	3
missing output	0	0	0	0	0
malformed output	0	0	0	0	0
timeout	0	0	0	0	0
agent failure	0	0	0	0	0
storage cap	0	0	0	0	0

G.4 Opportunity and resource totals

Elapsed seconds are summed across cells, not campaign wall time, and rounded to 0.001 s. Byte totals are exact; full precision remains in the sealed summary. These totals are not comparative efficiency estimands.

Table 16: Study J development: opportunity and resource totals.

Family	N	Elapsed s	Artifact B	Trajectory B
All four families	72	10404.633	1080	445129
Intervals	18	2012.013	234	114960
Records	18	2858.667	288	108094
Ready jobs	18	2823.923	270	116996
Bitfields	18	2710.029	288	105079

Complete descriptive development evidence only; no significance, equivalence, recurrence, moderation, transport, or H/I activation claim.

Appendix H. Prospectively frozen operational confirmation

H.1 Scientific question, frame and independent units

The fresh confirmation tests whether identifying examples attenuate the correct-minus-generic Skill advantage on more operationally demanding, untouched inputs. Its eight fixed constructed workflows are CSV export, invoice ledger, URL query export, Unicode index, route manifest, grouped nullable counts, checksum manifest and asset selection. Eight new input panels per workflow and both convention orientations give 128 atomic waves, each containing all nine E0/E1/E2 × K0/K1/K2 conditions: 1,152 opportunities. The four outputs required within an opportunity are jointly committed before feedback. All four must be correct for complete execution success; they are dependent probes, not additional independent opportunities or families.

E0 examples leave the two candidate conventions compatible, E1 examples identify the applicable convention, and E2 appends its explicit statement to otherwise unchanged E1 evidence. The assigned Skill supplies generic guidance, the correct convention, or the inverted convention. Fresh panels preserve the qualified structural probes and operational pipeline requirements. No P1 observation, public qualification input, excluded-epoch output or model-performance screening enters this bank. These remain eight fixed AI-constructed workflow templates, not a probability sample of families or naturally authored Skills. The development report in Appendix G stays separate.

H.2 Assignment, estimand and fixed uncertainty

One permanently consumed preparation commits a 32,832-byte entropy tape before generation. Each wave uses its own 256-byte assignment segment to rejection- sample a uniform permutation of the nine conditions onto nine opaque slots; separate keys parameterize inputs and opaque identifiers.

There is no search for a favorable assignment, replacement tape, reroll or optional sample extension. The complete bank and fixed wave order are committed before the first opportunity.

Let $p_{b,t}$ be the average binary potential response to condition t over the nine slots in wave b, conditional on the fixed bank, configuration and exogenous backend random tapes. The sole primary estimand is

$$\theta_{\text{slot}} = \frac{1}{128}\sum_{b=1}^{128}[(p_{b,E0K1} - p_{b,E0K0}) - (p_{b,E1K1} - p_{b,E1K0})].$$

It is an unnormalized difference-in-differences, not an interval for future provider calls or a population of workflows. Independent within-wave permutations and no treatment interference across slots or waves are required. Fresh isolated clients prevent designed cross-cell information transfer but do not establish provider-side no-interference. A verified assignment, isolation or binding violation invalidates confirmation rather than licensing a different analysis.

The fixed two-sided 95% Bernstein interval uses per-wave variance bound $10/9$ and centered bound 4. For $N = 128$ and $L = \log(40)$, its radius is $4L/(3N) + \sqrt{2(10/9)L/N + [4L/(3N)]^2} = 0.294394$, with endpoints clipped to $[-2, 2]$. This scale was selected from prospective worst-case precision, not an effect or variance fitted to the pilot. The only primary reporting worlds are lower endpoint above zero, upper endpoint below zero, and otherwise unresolved direction. No secondary significance, equivalence or recurrence test is authorized. Even a positive primary contrast does not establish an E0 benefit, successful information recovery, or zero Skill value at E1; component effects and failures must accompany it.

H.3 Execution, irreversible boundaries and one look

The pinned request remains `gpt-5.6-terra` with medium reasoning through Codex CLI 0.144.5 and Python 3.13.2. Each cell has a fresh client and workspace, read-only runtime, command-network denial, and trusted verification outside the command sandbox. Unavailable server-reported model identity is not inferred. The opportunity limits are 600 seconds, 384 KiB combined raw stream capture, and 64 KiB for the committed output. A separate fixed 32-MiB native volume contains each cell's workspace and isolated client state; reaching the 256-KiB free-space threshold is a latched resource failure. Volumes are prepared before any of the nine clients starts and retired only after all owned process groups settle. Ambiguous cleanup never authorizes a retry.

After a valid opportunity begins, resource-capped, timed-out, process-failed, missing, malformed and incorrect executions remain zero primary outcomes, in that fixed classification order. Only a whole nine-cell wave can seal. The detached single owner has no automatic restart loop. Exact intact-prefix handoffs are bounded prospectively; an unsealed opportunity is never replayed. Source, material, model/runtime and every retained capture hash are revalidated before terminal admission. Integrity failures exclude confirmation unopened.

A separately qualified, irreversible infrastructure terminal may admit the exact sealed prefix once. The entire unsealed and unexecuted suffix stays unopened and remains in the full planned grid as unknown, not as agent failures or dropped observations. If propagating each unknown response through its full $[0, 1]$ range gives $[a, b]$ for the primary observed contrast, report $[a-r, b+r]\cap[-2, 2]$ with the same full-sample radius. A primary point estimate is absent unless all its responses are known. Missing target and resource measurements remain missing. This rule applies only to the new confirmation; it changes no Study G exclusion or consumed P1 intake.

After retired-owner and terminal admission, one permanent intake lock is committed before any outcome decoding. The complete report retains overall, eight-workflow and sixteen workflow-by-orientation strata in fixed order. Each has all nine cell rates or missingness bounds, all 27 registered contrasts, dependent target-position counts, failures, and recorded time/byte totals with missingness counts. Only the overall primary contrast has a confidence interval. No sorting by effect, omitted unfavorable field, selected unsealed cell, trajectory interpretation or second analysis is permitted.

H.4 Prospective provenance and current evidential status

The statistical freeze is SHA-256 `5b379948584f2f94c26bc39230a4d3baa6e9e9635d3df42dfd9b6ad47bd2b62e`. The exact 38-source admission qualification is `40e58e811041f15ba40fc81f89f3712573cc1a96c0db8a43ad908e56ee0a77e8`; the launch manifest is `c3562ab6c204f08e82c9ad8326ed050d0a876857f60a61d0497809adef833170`. These bind the local protocols, one-time bank, runtime, owner, capture, terminal admission and fixed single-intake analysis. Failed synthetic qualification receipts are preserved; passing checks do not relabel them as passes or supply scientific observations.

This appendix preserves the prospectively frozen methods. The admitted single-intake report appears in Section 4.5 and Appendix I. Earlier result sections and Appendix G remain unchanged. No interim conclusion or new analysis was introduced. No result world alone establishes internal rule learning, unseen-input correctness, naturalistic transport, authoring value, or repair of the earlier failed recurrence criterion.

Appendix I. Complete operational confirmation report

Completed single-intake confirmation report

The admitted complete report contains 128/128 sealed waves, 1152/1,152 known opportunities and 0 unknown opportunities. The primary E0-minus-E1 attenuation point is 0.085938; arithmetic missingness bounds are [0.085938, 0.085938]. The sole two-sided 95% Bernstein interval is [-0.208456, 0.380331], using the unchanged full-sample radius 0.294394. The prespecified interval leaves the direction of the E0-to-E1 attenuation contrast unresolved in this fixed-slot bank.

This contrast alone establishes neither an E0 benefit nor information recovery or a zero E1 increment. All components, targets, failures and resources remain visible. No equivalence, internal rule learning, unseen-input correctness, population-family or future-backend inference, naturalistic transport, authoring value, or repair of the earlier recurrence gate follows. The prior banks remain separate.

S = complete successes, U = unknown opportunities, N = planned opportunities. Point = NA when any response in that cell is unknown; lower/upper are arithmetic missingness bounds, not confidence limits. All rates/bounds are displayed to six decimals; the bound summary and coverage map retain full precision. Target positions 1-4 are dependent probes, not extra independent observations. A resource failure can retain correct target bits while complete execution fails. Status columns: C correct, I incorrect output, M malformed, A absent/missing output, T timeout, P process failure, R resource cap, U infrastructure unknown. Unknowns are not failures. Resource totals are recorded totals only; U and N remain visible even when the recorded total is zero. U comp. counts unknown contrast components. All secondary contrasts are descriptive, with no intervals or tests added.

I.1 Boundary, primary interval and provenance

Table 17: Study J operational confirmation: fixed primary interval, reporting boundary and provenance fields.

Field	Value
name	attenuation_E0_E1_K1_K0
estimand	finite_slot_conditional_average
point	0.085938
missingness_bounds	0.085938, 0.085938
unavailable_components	0
confidence_level	0.950000
method	fixed_variance_upper_bound_Bernstein_two_sided
complete_data_radius	0.294394
confidence_interval	-0.208456, 0.380331
claim_world	direction_unresolved
schema	study-j-operational-fixed-report-v1

Continued on next page

Table 17 (continued): Study J operational confirmation: fixed primary interval, reporting boundary and provenance fields.

Field	Value
data_boundary	complete
planned_waves	128
sealed_waves	128
planned_opportunities	1152
known_opportunities	1152
unavailable_opportunities	0
family_order	csv_export; invoice_ledger; url_query_export; unicode_index; route_manifest; grouped_nullable_counts; checksum_manifest; asset_selection
condition_order	E0K0; E0K1; E0K2; E1K0; E1K1; E1K2; E2K0; E2K1; E2K2
stratum_order	overall; csv_export; invoice_ledger; url_query_export; unicode_index; route_manifest; grouped_nullable_counts; checksum_manifest; asset_selection; csv_export:orientation-0; csv_export:orientation-1; invoice_ledger:orientation-0; invoice_ledger:orientation-1; url_query_export:orientation-0; url_query_export:orientation-1; unicode_index:orientation-0; unicode_index:orientation-1; route_manifest:orientation-0; route_manifest:orientation-1; grouped_nullable_counts:orientation-0; grouped_nullable_counts:orientation-1; checksum_manifest:orientation-0; checksum_manifest:orientation-1; asset_selection:orientation-0; asset_selection:orientation-1
contrast_order	skill_E0_K1_K0; skill_E0_K2_K0; skill_E0_K1_K2; skill_E1_K1_K0; skill_E1_K2_K0; skill_E1_K1_K2; skill_E2_K1_K0; skill_E2_K2_K0; skill_E2_K1_K2; evidence_E1_E0_K0; evidence_E2_E0_K0; evidence_E2_E1_K0; evidence_E1_E0_K1; evidence_E2_E0_K1; evidence_E2_E1_K1; evidence_E1_E0_K2; evidence_E2_E0_K2; evidence_E2_E1_K2; attenuation_E0_E1_K1_K0; attenuation_E0_E1_K2_K0; attenuation_E0_E1_K1_K2; attenuation_E0_E2_K1_K0; attenuation_E0_E2_K2_K0; attenuation_E0_E2_K1_K2; attenuation_E1_E2_K1_K0; attenuation_E1_E2_K2_K0; attenuation_E1_E2_K1_K2
limits	secondary_fields_are_descriptive; no_equivalence_claim; no_population_family_or_future_backend_inference; no_internal_rule_learning_or_authoring_claim; no_retry_extension_or_second_look

Completed intake receipt SHA-256: `acf11d8e38e341b06b9aeae5d922c6e104cfdcbb2b201868a8fbb78833ee5a2e`. Bound summary SHA-256: `257503fbdd4e97d19f58b0edf86ede9cf7cb8879484926a17ffee5a521a058b4`. Frozen launch manifest SHA-256: `c3562ab6c204f08e82c9ad8326ed050d0a876857f60a61d0497809adef833170`. These hashes identify the supplied committed report; this formatter does not independently authenticate its origin, repeat terminal admission, inspect rows/captures, or make another scientific look. The independent receipt digest must be taken from the actual admitted single-intake handoff, not recomputed to authorize arbitrary input.

I.2 Overall

Complete execution

Table 18: Study J, overall: complete successes and arithmetic missingness bounds.

Cell	S	U	N	Point	Lower	Upper
E0K0	13	0	128	0.101562	0.101562	0.101562
E0K1	24	0	128	0.187500	0.187500	0.187500
E0K2	0	0	128	0.000000	0.000000	0.000000
E1K0	30	0	128	0.234375	0.234375	0.234375
E1K1	30	0	128	0.234375	0.234375	0.234375
E1K2	3	0	128	0.023438	0.023438	0.023438
E2K0	29	0	128	0.226562	0.226562	0.226562
E2K1	27	0	128	0.210938	0.210938	0.210938
E2K2	21	0	128	0.164062	0.164062	0.164062

Dependent target positions

Table 19: Study J, overall: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E0K0	1	15	0	128	0.117188	0.117188	0.117188
E0K0	2	15	0	128	0.117188	0.117188	0.117188
E0K0	3	15	0	128	0.117188	0.117188	0.117188
E0K0	4	13	0	128	0.101562	0.101562	0.101562
E0K1	1	29	0	128	0.226562	0.226562	0.226562
E0K1	2	28	0	128	0.218750	0.218750	0.218750
E0K1	3	26	0	128	0.203125	0.203125	0.203125
E0K1	4	26	0	128	0.203125	0.203125	0.203125
E0K2	1	0	0	128	0.000000	0.000000	0.000000
E0K2	2	0	0	128	0.000000	0.000000	0.000000
E0K2	3	0	0	128	0.000000	0.000000	0.000000
E0K2	4	0	0	128	0.000000	0.000000	0.000000
E1K0	1	31	0	128	0.242188	0.242188	0.242188
E1K0	2	31	0	128	0.242188	0.242188	0.242188
E1K0	3	31	0	128	0.242188	0.242188	0.242188
E1K0	4	30	0	128	0.234375	0.234375	0.234375
E1K1	1	30	0	128	0.234375	0.234375	0.234375
E1K1	2	30	0	128	0.234375	0.234375	0.234375
E1K1	3	30	0	128	0.234375	0.234375	0.234375
E1K1	4	30	0	128	0.234375	0.234375	0.234375
E1K2	1	3	0	128	0.023438	0.023438	0.023438
E1K2	2	3	0	128	0.023438	0.023438	0.023438
E1K2	3	3	0	128	0.023438	0.023438	0.023438
E1K2	4	3	0	128	0.023438	0.023438	0.023438
E2K0	1	30	0	128	0.234375	0.234375	0.234375
E2K0	2	30	0	128	0.234375	0.234375	0.234375
E2K0	3	30	0	128	0.234375	0.234375	0.234375
E2K0	4	29	0	128	0.226562	0.226562	0.226562

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Table 19 (continued): Study J, overall: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E2K1	1	30	0	128	0.234375	0.234375	0.234375
E2K1	2	30	0	128	0.234375	0.234375	0.234375
E2K1	3	28	0	128	0.218750	0.218750	0.218750
E2K1	4	29	0	128	0.226562	0.226562	0.226562
E2K2	1	23	0	128	0.179688	0.179688	0.179688
E2K2	2	23	0	128	0.179688	0.179688	0.179688
E2K2	3	22	0	128	0.171875	0.171875	0.171875
E2K2	4	21	0	128	0.164062	0.164062	0.164062

Failure and unknown categories

Table 20: Study J, overall: every registered failure and unknown category, including zeros.

Cell	C	I	M	A	T	P	R	U
E0K0	13	18	0	0	0	97	0	0
E0K1	24	6	1	0	0	97	0	0
E0K2	0	31	0	0	0	97	0	0
E1K0	30	1	0	0	0	97	0	0
E1K1	30	1	0	0	0	97	0	0
E1K2	3	28	0	0	0	97	0	0
E2K0	29	1	1	0	0	97	0	0
E2K1	27	4	0	0	0	97	0	0
E2K2	21	8	2	0	0	97	0	0

Recorded resources

Table 21: Study J, overall: recorded totals with unknown and planned opportunities retained; not comparative efficiency estimands.

Cell	Resource	Recorded total	U	N
E0K0	Time (s)	4630.705625	0	128
E0K0	Trajectory (B)	852063	0	128
E0K0	Artifact (B)	48062	0	128
E0K1	Time (s)	4634.275974	0	128
E0K1	Trajectory (B)	840333	0	128
E0K1	Artifact (B)	48185	0	128
E0K2	Time (s)	5237.971333	0	128
E0K2	Trajectory (B)	915914	0	128
E0K2	Artifact (B)	48274	0	128
E1K0	Time (s)	4745.206826	0	128
E1K0	Trajectory (B)	890664	0	128
E1K0	Artifact (B)	48113	0	128
E1K1	Time (s)	4266.756806	0	128
E1K1	Trajectory (B)	823972	0	128
E1K1	Artifact (B)	48127	0	128

Continued on next page

Table 21 (continued): Study J, overall: recorded totals with unknown and planned opportunities retained; not comparative efficiency estimands.

Cell	Resource	Recorded total	U	N
E1K2	Time (s)	5619.788500	0	128
E1K2	Trajectory (B)	893971	0	128
E1K2	Artifact (B)	48238	0	128
E2K0	Time (s)	4726.849229	0	128
E2K0	Trajectory (B)	903115	0	128
E2K0	Artifact (B)	48115	0	128
E2K1	Time (s)	4768.082683	0	128
E2K1	Trajectory (B)	898617	0	128
E2K1	Artifact (B)	48124	0	128
E2K2	Time (s)	4629.190607	0	128
E2K2	Trajectory (B)	875399	0	128
E2K2	Artifact (B)	48126	0	128

All descriptive contrasts

Table 22: Study J, overall: all descriptive contrasts in fixed order; lower/upper are arithmetic missingness bounds, not confidence intervals.

Contrast	Point	Lower	Upper	U comp.
E0: K1 - K0	0.085938	0.085938	0.085938	0
E0: K2 - K0	-0.101562	-0.101562	-0.101562	0
E0: K1 - K2	0.187500	0.187500	0.187500	0
E1: K1 - K0	0.000000	0.000000	0.000000	0
E1: K2 - K0	-0.210938	-0.210938	-0.210938	0
E1: K1 - K2	0.210938	0.210938	0.210938	0
E2: K1 - K0	-0.015625	-0.015625	-0.015625	0
E2: K2 - K0	-0.062500	-0.062500	-0.062500	0
E2: K1 - K2	0.046875	0.046875	0.046875	0
K0: E1 - E0	0.132812	0.132812	0.132812	0
K0: E2 - E0	0.125000	0.125000	0.125000	0
K0: E2 - E1	-0.007812	-0.007812	-0.007812	0
K1: E1 - E0	0.046875	0.046875	0.046875	0
K1: E2 - E0	0.023438	0.023438	0.023438	0
K1: E2 - E1	-0.023438	-0.023438	-0.023438	0
K2: E1 - E0	0.023438	0.023438	0.023438	0
K2: E2 - E0	0.164062	0.164062	0.164062	0
K2: E2 - E1	0.140625	0.140625	0.140625	0
(E0 - E1): (K1 - K0)	0.085938	0.085938	0.085938	0
(E0 - E1): (K2 - K0)	0.109375	0.109375	0.109375	0
(E0 - E1): (K1 - K2)	-0.023438	-0.023438	-0.023438	0
(E0 - E2): (K1 - K0)	0.101562	0.101562	0.101562	0
(E0 - E2): (K2 - K0)	-0.039062	-0.039062	-0.039062	0
(E0 - E2): (K1 - K2)	0.140625	0.140625	0.140625	0
(E1 - E2): (K1 - K0)	0.015625	0.015625	0.015625	0
(E1 - E2): (K2 - K0)	-0.148438	-0.148438	-0.148438	0
(E1 - E2): (K1 - K2)	0.164062	0.164062	0.164062	0

I.3 CSV EXPORT

COMPLETE EXECUTION

Table 23: Study J, csv export: complete successes and arithmetic missingness bounds.

Cell	S	U	N	Point	Lower	Upper
E0K0	7	0	16	0.437500	0.437500	0.437500
E0K1	11	0	16	0.687500	0.687500	0.687500
E0K2	0	0	16	0.000000	0.000000	0.000000
E1K0	15	0	16	0.937500	0.937500	0.937500
E1K1	15	0	16	0.937500	0.937500	0.937500
E1K2	3	0	16	0.187500	0.187500	0.187500
E2K0	14	0	16	0.875000	0.875000	0.875000
E2K1	14	0	16	0.875000	0.875000	0.875000
E2K2	11	0	16	0.687500	0.687500	0.687500

DEPENDENT TARGET POSITIONS

Table 24: Study J, csv export: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E0K0	1	8	0	16	0.500000	0.500000	0.500000
E0K0	2	8	0	16	0.500000	0.500000	0.500000
E0K0	3	8	0	16	0.500000	0.500000	0.500000
E0K0	4	7	0	16	0.437500	0.437500	0.437500
E0K1	1	14	0	16	0.875000	0.875000	0.875000
E0K1	2	14	0	16	0.875000	0.875000	0.875000
E0K1	3	12	0	16	0.750000	0.750000	0.750000
E0K1	4	11	0	16	0.687500	0.687500	0.687500
E0K2	1	0	0	16	0.000000	0.000000	0.000000
E0K2	2	0	0	16	0.000000	0.000000	0.000000
E0K2	3	0	0	16	0.000000	0.000000	0.000000
E0K2	4	0	0	16	0.000000	0.000000	0.000000
E1K0	1	16	0	16	1.000000	1.000000	1.000000
E1K0	2	16	0	16	1.000000	1.000000	1.000000
E1K0	3	16	0	16	1.000000	1.000000	1.000000
E1K0	4	15	0	16	0.937500	0.937500	0.937500
E1K1	1	15	0	16	0.937500	0.937500	0.937500
E1K1	2	15	0	16	0.937500	0.937500	0.937500
E1K1	3	15	0	16	0.937500	0.937500	0.937500
E1K1	4	15	0	16	0.937500	0.937500	0.937500
E1K2	1	3	0	16	0.187500	0.187500	0.187500
E1K2	2	3	0	16	0.187500	0.187500	0.187500
E1K2	3	3	0	16	0.187500	0.187500	0.187500
E1K2	4	3	0	16	0.187500	0.187500	0.187500
E2K0	1	15	0	16	0.937500	0.937500	0.937500
E2K0	2	15	0	16	0.937500	0.937500	0.937500
E2K0	3	15	0	16	0.937500	0.937500	0.937500
E2K0	4	14	0	16	0.875000	0.875000	0.875000

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Table 24 (continued): Study J, csv export: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E2K1	1	15	0	16	0.937500	0.937500	0.937500
E2K1	2	15	0	16	0.937500	0.937500	0.937500
E2K1	3	15	0	16	0.937500	0.937500	0.937500
E2K1	4	14	0	16	0.875000	0.875000	0.875000
E2K2	1	13	0	16	0.812500	0.812500	0.812500
E2K2	2	13	0	16	0.812500	0.812500	0.812500
E2K2	3	12	0	16	0.750000	0.750000	0.750000
E2K2	4	11	0	16	0.687500	0.687500	0.687500

Failure and unknown categories

Table 25: Study J, csv export: every registered failure and unknown category, including zeros.

Cell	C	I	M	A	T	P	R	U
E0K0	7	9	0	0	0	0	0	0
E0K1	11	4	1	0	0	0	0	0
E0K2	0	16	0	0	0	0	0	0
E1K0	15	1	0	0	0	0	0	0
E1K1	15	1	0	0	0	0	0	0
E1K2	3	13	0	0	0	0	0	0
E2K0	14	1	1	0	0	0	0	0
E2K1	14	2	0	0	0	0	0	0
E2K2	11	3	2	0	0	0	0	0

Recorded resources

Table 26: Study J, csv export: recorded totals with unknown and planned opportunities retained; not comparative efficiency estimands.

Cell	Resource	Recorded total	U	N
E0K0	Time (s)	1858.168462	0	16
E0K0	Trajectory (B)	493407	0	16
E0K0	Artifact (B)	34480	0	16
E0K1	Time (s)	1994.008966	0	16
E0K1	Trajectory (B)	500144	0	16
E0K1	Artifact (B)	34603	0	16
E0K2	Time (s)	2568.853879	0	16
E0K2	Trajectory (B)	582360	0	16
E0K2	Artifact (B)	34695	0	16
E1K0	Time (s)	2036.425648	0	16
E1K0	Trajectory (B)	554651	0	16
E1K0	Artifact (B)	34532	0	16
E1K1	Time (s)	1642.506521	0	16
E1K1	Trajectory (B)	497895	0	16
E1K1	Artifact (B)	34546	0	16

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Table 26 (continued): Study J, csv export: recorded totals with unknown and planned opportunities retained; not comparative efficiency estimands.

Cell	Resource	Recorded total	U	N
E1K2	Time (s)	2598.910816	0	16
E1K2	Trajectory (B)	559264	0	16
E1K2	Artifact (B)	34657	0	16
E2K0	Time (s)	2079.930999	0	16
E2K0	Trajectory (B)	566923	0	16
E2K0	Artifact (B)	34534	0	16
E2K1	Time (s)	2052.770167	0	16
E2K1	Trajectory (B)	561046	0	16
E2K1	Artifact (B)	34543	0	16
E2K2	Time (s)	1977.902739	0	16
E2K2	Trajectory (B)	524632	0	16
E2K2	Artifact (B)	34545	0	16

ALL DESCRIPTIVE CONTRASTS

Table 27: Study J, csv export: all descriptive contrasts in fixed order; lower/upper are arithmetic missingness bounds, not confidence intervals.

Contrast	Point	Lower	Upper	U comp.
E0: K1 - K0	0.250000	0.250000	0.250000	0
E0: K2 - K0	-0.437500	-0.437500	-0.437500	0
E0: K1 - K2	0.687500	0.687500	0.687500	0
E1: K1 - K0	0.000000	0.000000	0.000000	0
E1: K2 - K0	-0.750000	-0.750000	-0.750000	0
E1: K1 - K2	0.750000	0.750000	0.750000	0
E2: K1 - K0	0.000000	0.000000	0.000000	0
E2: K2 - K0	-0.187500	-0.187500	-0.187500	0
E2: K1 - K2	0.187500	0.187500	0.187500	0
K0: E1 - E0	0.500000	0.500000	0.500000	0
K0: E2 - E0	0.437500	0.437500	0.437500	0
K0: E2 - E1	-0.062500	-0.062500	-0.062500	0
K1: E1 - E0	0.250000	0.250000	0.250000	0
K1: E2 - E0	0.187500	0.187500	0.187500	0
K1: E2 - E1	-0.062500	-0.062500	-0.062500	0
K2: E1 - E0	0.187500	0.187500	0.187500	0
K2: E2 - E0	0.687500	0.687500	0.687500	0
K2: E2 - E1	0.500000	0.500000	0.500000	0
(E0 - E1): (K1 - K0)	0.250000	0.250000	0.250000	0
(E0 - E1): (K2 - K0)	0.312500	0.312500	0.312500	0
(E0 - E1): (K1 - K2)	-0.062500	-0.062500	-0.062500	0
(E0 - E2): (K1 - K0)	0.250000	0.250000	0.250000	0
(E0 - E2): (K2 - K0)	-0.250000	-0.250000	-0.250000	0
(E0 - E2): (K1 - K2)	0.500000	0.500000	0.500000	0
(E1 - E2): (K1 - K0)	0.000000	0.000000	0.000000	0
(E1 - E2): (K2 - K0)	-0.562500	-0.562500	-0.562500	0
(E1 - E2): (K1 - K2)	0.562500	0.562500	0.562500	0

I.4 Invoice ledger

Complete execution

Table 28: Study J, invoice ledger: complete successes and arithmetic missingness bounds.

Cell	S	U	N	Point	Lower	Upper
E0K0	6	0	16	0.375000	0.375000	0.375000
E0K1	13	0	16	0.812500	0.812500	0.812500
E0K2	0	0	16	0.000000	0.000000	0.000000
E1K0	15	0	16	0.937500	0.937500	0.937500
E1K1	15	0	16	0.937500	0.937500	0.937500
E1K2	0	0	16	0.000000	0.000000	0.000000
E2K0	15	0	16	0.937500	0.937500	0.937500
E2K1	13	0	16	0.812500	0.812500	0.812500
E2K2	10	0	16	0.625000	0.625000	0.625000

Dependent target positions

Table 29: Study J, invoice ledger: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E0K0	1	7	0	16	0.437500	0.437500	0.437500
E0K0	2	7	0	16	0.437500	0.437500	0.437500
E0K0	3	7	0	16	0.437500	0.437500	0.437500
E0K0	4	6	0	16	0.375000	0.375000	0.375000
E0K1	1	15	0	16	0.937500	0.937500	0.937500
E0K1	2	14	0	16	0.875000	0.875000	0.875000
E0K1	3	14	0	16	0.875000	0.875000	0.875000
E0K1	4	15	0	16	0.937500	0.937500	0.937500
E0K2	1	0	0	16	0.000000	0.000000	0.000000
E0K2	2	0	0	16	0.000000	0.000000	0.000000
E0K2	3	0	0	16	0.000000	0.000000	0.000000
E0K2	4	0	0	16	0.000000	0.000000	0.000000
E1K0	1	15	0	16	0.937500	0.937500	0.937500
E1K0	2	15	0	16	0.937500	0.937500	0.937500
E1K0	3	15	0	16	0.937500	0.937500	0.937500
E1K0	4	15	0	16	0.937500	0.937500	0.937500
E1K1	1	15	0	16	0.937500	0.937500	0.937500
E1K1	2	15	0	16	0.937500	0.937500	0.937500
E1K1	3	15	0	16	0.937500	0.937500	0.937500
E1K1	4	15	0	16	0.937500	0.937500	0.937500
E1K2	1	0	0	16	0.000000	0.000000	0.000000
E1K2	2	0	0	16	0.000000	0.000000	0.000000
E1K2	3	0	0	16	0.000000	0.000000	0.000000
E1K2	4	0	0	16	0.000000	0.000000	0.000000
E2K0	1	15	0	16	0.937500	0.937500	0.937500
E2K0	2	15	0	16	0.937500	0.937500	0.937500
E2K0	3	15	0	16	0.937500	0.937500	0.937500
E2K0	4	15	0	16	0.937500	0.937500	0.937500

Continued on next page

Table 29 (continued): Study J, invoice ledger: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E2K1	1	15	0	16	0.937500	0.937500	0.937500
E2K1	2	15	0	16	0.937500	0.937500	0.937500
E2K1	3	13	0	16	0.812500	0.812500	0.812500
E2K1	4	15	0	16	0.937500	0.937500	0.937500
E2K2	1	10	0	16	0.625000	0.625000	0.625000
E2K2	2	10	0	16	0.625000	0.625000	0.625000
E2K2	3	10	0	16	0.625000	0.625000	0.625000
E2K2	4	10	0	16	0.625000	0.625000	0.625000

Failure and unknown categories

Table 30: Study J, invoice ledger: every registered failure and unknown category, including zeros.

Cell	C	I	M	A	T	P	R	U
E0K0	6	9	0	0	0	1	0	0
E0K1	13	2	0	0	0	1	0	0
E0K2	0	15	0	0	0	1	0	0
E1K0	15	0	0	0	0	1	0	0
E1K1	15	0	0	0	0	1	0	0
E1K2	0	15	0	0	0	1	0	0
E2K0	15	0	0	0	0	1	0	0
E2K1	13	2	0	0	0	1	0	0
E2K2	10	5	0	0	0	1	0	0

Recorded resources

Table 31: Study J, invoice ledger: recorded totals with unknown and planned opportunities retained; not comparative efficiency estimands.

Cell	Resource	Recorded total	U	N
E0K0	Time (s)	1222.330190	0	16
E0K0	Trajectory (B)	312018	0	16
E0K0	Artifact (B)	13582	0	16
E0K1	Time (s)	1089.039567	0	16
E0K1	Trajectory (B)	293694	0	16
E0K1	Artifact (B)	13582	0	16
E0K2	Time (s)	1122.199243	0	16
E0K2	Trajectory (B)	287059	0	16
E0K2	Artifact (B)	13579	0	16
E1K0	Time (s)	1152.143683	0	16
E1K0	Trajectory (B)	289661	0	16
E1K0	Artifact (B)	13581	0	16
E1K1	Time (s)	1063.710523	0	16
E1K1	Trajectory (B)	279439	0	16
E1K1	Artifact (B)	13581	0	16

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Table 31 (continued): Study J, invoice ledger: recorded totals with unknown and planned opportunities retained; not comparative efficiency estimands.

Cell	Resource	Recorded total	U	N
E1K2	Time (s)	1466.968510	0	16
E1K2	Trajectory (B)	288355	0	16
E1K2	Artifact (B)	13581	0	16
E2K0	Time (s)	1088.148215	0	16
E2K0	Trajectory (B)	289697	0	16
E2K0	Artifact (B)	13581	0	16
E2K1	Time (s)	1163.871646	0	16
E2K1	Trajectory (B)	291362	0	16
E2K1	Artifact (B)	13581	0	16
E2K2	Time (s)	1104.405246	0	16
E2K2	Trajectory (B)	303790	0	16
E2K2	Artifact (B)	13581	0	16

ALL DESCRIPTIVE CONTRASTS

Table 32: Study J, invoice ledger: all descriptive contrasts in fixed order; lower/upper are arithmetic missingness bounds, not confidence intervals.

Contrast	Point	Lower	Upper	U comp.
E0: K1 - K0	0.437500	0.437500	0.437500	0
E0: K2 - K0	-0.375000	-0.375000	-0.375000	0
E0: K1 - K2	0.812500	0.812500	0.812500	0
E1: K1 - K0	0.000000	0.000000	0.000000	0
E1: K2 - K0	-0.937500	-0.937500	-0.937500	0
E1: K1 - K2	0.937500	0.937500	0.937500	0
E2: K1 - K0	-0.125000	-0.125000	-0.125000	0
E2: K2 - K0	-0.312500	-0.312500	-0.312500	0
E2: K1 - K2	0.187500	0.187500	0.187500	0
K0: E1 - E0	0.562500	0.562500	0.562500	0
K0: E2 - E0	0.562500	0.562500	0.562500	0
K0: E2 - E1	0.000000	0.000000	0.000000	0
K1: E1 - E0	0.125000	0.125000	0.125000	0
K1: E2 - E0	0.000000	0.000000	0.000000	0
K1: E2 - E1	-0.125000	-0.125000	-0.125000	0
K2: E1 - E0	0.000000	0.000000	0.000000	0
K2: E2 - E0	0.625000	0.625000	0.625000	0
K2: E2 - E1	0.625000	0.625000	0.625000	0
(E0 - E1): (K1 - K0)	0.437500	0.437500	0.437500	0
(E0 - E1): (K2 - K0)	0.562500	0.562500	0.562500	0
(E0 - E1): (K1 - K2)	-0.125000	-0.125000	-0.125000	0
(E0 - E2): (K1 - K0)	0.562500	0.562500	0.562500	0
(E0 - E2): (K2 - K0)	-0.062500	-0.062500	-0.062500	0
(E0 - E2): (K1 - K2)	0.625000	0.625000	0.625000	0
(E1 - E2): (K1 - K0)	0.125000	0.125000	0.125000	0
(E1 - E2): (K2 - K0)	-0.625000	-0.625000	-0.625000	0
(E1 - E2): (K1 - K2)	0.750000	0.750000	0.750000	0

I.5 URL QUERY EXPORT

COMPLETE EXECUTION

Table 33: Study J, url query export: complete successes and arithmetic missingness bounds.

Cell	S	U	N	Point	Lower	Upper
E0K0	0	0	16	0.000000	0.000000	0.000000
E0K1	0	0	16	0.000000	0.000000	0.000000
E0K2	0	0	16	0.000000	0.000000	0.000000
E1K0	0	0	16	0.000000	0.000000	0.000000
E1K1	0	0	16	0.000000	0.000000	0.000000
E1K2	0	0	16	0.000000	0.000000	0.000000
E2K0	0	0	16	0.000000	0.000000	0.000000
E2K1	0	0	16	0.000000	0.000000	0.000000
E2K2	0	0	16	0.000000	0.000000	0.000000

DEPENDENT TARGET POSITIONS

Table 34: Study J, url query export: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E0K0	1	0	0	16	0.000000	0.000000	0.000000
E0K0	2	0	0	16	0.000000	0.000000	0.000000
E0K0	3	0	0	16	0.000000	0.000000	0.000000
E0K0	4	0	0	16	0.000000	0.000000	0.000000
E0K1	1	0	0	16	0.000000	0.000000	0.000000
E0K1	2	0	0	16	0.000000	0.000000	0.000000
E0K1	3	0	0	16	0.000000	0.000000	0.000000
E0K1	4	0	0	16	0.000000	0.000000	0.000000
E0K2	1	0	0	16	0.000000	0.000000	0.000000
E0K2	2	0	0	16	0.000000	0.000000	0.000000
E0K2	3	0	0	16	0.000000	0.000000	0.000000
E0K2	4	0	0	16	0.000000	0.000000	0.000000
E1K0	1	0	0	16	0.000000	0.000000	0.000000
E1K0	2	0	0	16	0.000000	0.000000	0.000000
E1K0	3	0	0	16	0.000000	0.000000	0.000000
E1K0	4	0	0	16	0.000000	0.000000	0.000000
E1K1	1	0	0	16	0.000000	0.000000	0.000000
E1K1	2	0	0	16	0.000000	0.000000	0.000000
E1K1	3	0	0	16	0.000000	0.000000	0.000000
E1K1	4	0	0	16	0.000000	0.000000	0.000000
E1K2	1	0	0	16	0.000000	0.000000	0.000000
E1K2	2	0	0	16	0.000000	0.000000	0.000000
E1K2	3	0	0	16	0.000000	0.000000	0.000000
E1K2	4	0	0	16	0.000000	0.000000	0.000000
E2K0	1	0	0	16	0.000000	0.000000	0.000000
E2K0	2	0	0	16	0.000000	0.000000	0.000000
E2K0	3	0	0	16	0.000000	0.000000	0.000000
E2K0	4	0	0	16	0.000000	0.000000	0.000000

Continued on next page

Table 34 (continued): Study J, url query export: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E2K1	1	0	0	16	0.000000	0.000000	0.000000
E2K1	2	0	0	16	0.000000	0.000000	0.000000
E2K1	3	0	0	16	0.000000	0.000000	0.000000
E2K1	4	0	0	16	0.000000	0.000000	0.000000
E2K2	1	0	0	16	0.000000	0.000000	0.000000
E2K2	2	0	0	16	0.000000	0.000000	0.000000
E2K2	3	0	0	16	0.000000	0.000000	0.000000
E2K2	4	0	0	16	0.000000	0.000000	0.000000

Failure and unknown categories

Table 35: Study J, url query export: every registered failure and unknown category, including zeros.

Cell	C	I	M	A	T	P	R	U
E0K0	0	0	0	0	0	16	0	0
E0K1	0	0	0	0	0	16	0	0
E0K2	0	0	0	0	0	16	0	0
E1K0	0	0	0	0	0	16	0	0
E1K1	0	0	0	0	0	16	0	0
E1K2	0	0	0	0	0	16	0	0
E2K0	0	0	0	0	0	16	0	0
E2K1	0	0	0	0	0	16	0	0
E2K2	0	0	0	0	0	16	0	0

Recorded resources

Table 36: Study J, url query export: recorded totals with unknown and planned opportunities retained; not comparative efficiency estimands.

Cell	Resource	Recorded total	U	N
E0K0	Time (s)	192.159473	0	16
E0K0	Trajectory (B)	7344	0	16
E0K0	Artifact (B)	0	0	16
E0K1	Time (s)	191.780994	0	16
E0K1	Trajectory (B)	7344	0	16
E0K1	Artifact (B)	0	0	16
E0K2	Time (s)	195.755552	0	16
E0K2	Trajectory (B)	7344	0	16
E0K2	Artifact (B)	0	0	16
E1K0	Time (s)	193.260156	0	16
E1K0	Trajectory (B)	7344	0	16
E1K0	Artifact (B)	0	0	16
E1K1	Time (s)	191.179173	0	16
E1K1	Trajectory (B)	7344	0	16
E1K1	Artifact (B)	0	0	16

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Table 36 (continued): Study J, url query export: recorded totals with unknown and planned opportunities retained; not comparative efficiency estimands.

Cell	Resource	Recorded total	U	N
E1K2	Time (s)	194.683452	0	16
E1K2	Trajectory (B)	7344	0	16
E1K2	Artifact (B)	0	0	16
E2K0	Time (s)	192.167699	0	16
E2K0	Trajectory (B)	7344	0	16
E2K0	Artifact (B)	0	0	16
E2K1	Time (s)	196.447513	0	16
E2K1	Trajectory (B)	7344	0	16
E2K1	Artifact (B)	0	0	16
E2K2	Time (s)	195.022070	0	16
E2K2	Trajectory (B)	7344	0	16
E2K2	Artifact (B)	0	0	16

ALL DESCRIPTIVE CONTRASTS

Table 37: Study J, url query export: all descriptive contrasts in fixed order; lower/upper are arithmetic missingness bounds, not confidence intervals.

Contrast	Point	Lower	Upper	U comp.
E0: K1 - K0	0.000000	0.000000	0.000000	0
E0: K2 - K0	0.000000	0.000000	0.000000	0
E0: K1 - K2	0.000000	0.000000	0.000000	0
E1: K1 - K0	0.000000	0.000000	0.000000	0
E1: K2 - K0	0.000000	0.000000	0.000000	0
E1: K1 - K2	0.000000	0.000000	0.000000	0
E2: K1 - K0	0.000000	0.000000	0.000000	0
E2: K2 - K0	0.000000	0.000000	0.000000	0
E2: K1 - K2	0.000000	0.000000	0.000000	0
K0: E1 - E0	0.000000	0.000000	0.000000	0
K0: E2 - E0	0.000000	0.000000	0.000000	0
K0: E2 - E1	0.000000	0.000000	0.000000	0
K1: E1 - E0	0.000000	0.000000	0.000000	0
K1: E2 - E0	0.000000	0.000000	0.000000	0
K1: E2 - E1	0.000000	0.000000	0.000000	0
K2: E1 - E0	0.000000	0.000000	0.000000	0
K2: E2 - E0	0.000000	0.000000	0.000000	0
K2: E2 - E1	0.000000	0.000000	0.000000	0
(E0 - E1): (K1 - K0)	0.000000	0.000000	0.000000	0
(E0 - E1): (K2 - K0)	0.000000	0.000000	0.000000	0
(E0 - E1): (K1 - K2)	0.000000	0.000000	0.000000	0
(E0 - E2): (K1 - K0)	0.000000	0.000000	0.000000	0
(E0 - E2): (K2 - K0)	0.000000	0.000000	0.000000	0
(E0 - E2): (K1 - K2)	0.000000	0.000000	0.000000	0
(E1 - E2): (K1 - K0)	0.000000	0.000000	0.000000	0
(E1 - E2): (K2 - K0)	0.000000	0.000000	0.000000	0
(E1 - E2): (K1 - K2)	0.000000	0.000000	0.000000	0

I.6 Unicode index

Complete execution

Table 38: Study J, unicode index: complete successes and arithmetic missingness bounds.

Cell	S	U	N	Point	Lower	Upper
E0K0	0	0	16	0.000000	0.000000	0.000000
E0K1	0	0	16	0.000000	0.000000	0.000000
E0K2	0	0	16	0.000000	0.000000	0.000000
E1K0	0	0	16	0.000000	0.000000	0.000000
E1K1	0	0	16	0.000000	0.000000	0.000000
E1K2	0	0	16	0.000000	0.000000	0.000000
E2K0	0	0	16	0.000000	0.000000	0.000000
E2K1	0	0	16	0.000000	0.000000	0.000000
E2K2	0	0	16	0.000000	0.000000	0.000000

Dependent target positions

Table 39: Study J, unicode index: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E0K0	1	0	0	16	0.000000	0.000000	0.000000
E0K0	2	0	0	16	0.000000	0.000000	0.000000
E0K0	3	0	0	16	0.000000	0.000000	0.000000
E0K0	4	0	0	16	0.000000	0.000000	0.000000
E0K1	1	0	0	16	0.000000	0.000000	0.000000
E0K1	2	0	0	16	0.000000	0.000000	0.000000
E0K1	3	0	0	16	0.000000	0.000000	0.000000
E0K1	4	0	0	16	0.000000	0.000000	0.000000
E0K2	1	0	0	16	0.000000	0.000000	0.000000
E0K2	2	0	0	16	0.000000	0.000000	0.000000
E0K2	3	0	0	16	0.000000	0.000000	0.000000
E0K2	4	0	0	16	0.000000	0.000000	0.000000
E1K0	1	0	0	16	0.000000	0.000000	0.000000
E1K0	2	0	0	16	0.000000	0.000000	0.000000
E1K0	3	0	0	16	0.000000	0.000000	0.000000
E1K0	4	0	0	16	0.000000	0.000000	0.000000
E1K1	1	0	0	16	0.000000	0.000000	0.000000
E1K1	2	0	0	16	0.000000	0.000000	0.000000
E1K1	3	0	0	16	0.000000	0.000000	0.000000
E1K1	4	0	0	16	0.000000	0.000000	0.000000
E1K2	1	0	0	16	0.000000	0.000000	0.000000
E1K2	2	0	0	16	0.000000	0.000000	0.000000
E1K2	3	0	0	16	0.000000	0.000000	0.000000
E1K2	4	0	0	16	0.000000	0.000000	0.000000
E2K0	1	0	0	16	0.000000	0.000000	0.000000
E2K0	2	0	0	16	0.000000	0.000000	0.000000
E2K0	3	0	0	16	0.000000	0.000000	0.000000
E2K0	4	0	0	16	0.000000	0.000000	0.000000

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Table 39 (continued): Study J, unicode index: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E2K1	1	0	0	16	0.000000	0.000000	0.000000
E2K1	2	0	0	16	0.000000	0.000000	0.000000
E2K1	3	0	0	16	0.000000	0.000000	0.000000
E2K1	4	0	0	16	0.000000	0.000000	0.000000
E2K2	1	0	0	16	0.000000	0.000000	0.000000
E2K2	2	0	0	16	0.000000	0.000000	0.000000
E2K2	3	0	0	16	0.000000	0.000000	0.000000
E2K2	4	0	0	16	0.000000	0.000000	0.000000

Failure and unknown categories

Table 40: Study J, unicode index: every registered failure and unknown category, including zeros.

Cell	C	I	M	A	T	P	R	U
E0K0	0	0	0	0	0	16	0	0
E0K1	0	0	0	0	0	16	0	0
E0K2	0	0	0	0	0	16	0	0
E1K0	0	0	0	0	0	16	0	0
E1K1	0	0	0	0	0	16	0	0
E1K2	0	0	0	0	0	16	0	0
E2K0	0	0	0	0	0	16	0	0
E2K1	0	0	0	0	0	16	0	0
E2K2	0	0	0	0	0	16	0	0

Recorded resources

Table 41: Study J, unicode index: recorded totals with unknown and planned opportunities retained; not comparative efficiency estimands.

Cell	Resource	Recorded total	U	N
E0K0	Time (s)	217.986041	0	16
E0K0	Trajectory (B)	7344	0	16
E0K0	Artifact (B)	0	0	16
E0K1	Time (s)	217.135832	0	16
E0K1	Trajectory (B)	7344	0	16
E0K1	Artifact (B)	0	0	16
E0K2	Time (s)	219.160801	0	16
E0K2	Trajectory (B)	7344	0	16
E0K2	Artifact (B)	0	0	16
E1K0	Time (s)	217.796130	0	16
E1K0	Trajectory (B)	7344	0	16
E1K0	Artifact (B)	0	0	16
E1K1	Time (s)	218.512208	0	16
E1K1	Trajectory (B)	7344	0	16
E1K1	Artifact (B)	0	0	16

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Table 41 (continued): Study J, unicode index: recorded totals with unknown and planned opportunities retained; not comparative efficiency estimands.

Cell	Resource	Recorded total	U	N
E1K2	Time (s)	218.543272	0	16
E1K2	Trajectory (B)	7344	0	16
E1K2	Artifact (B)	0	0	16
E2K0	Time (s)	217.012837	0	16
E2K0	Trajectory (B)	7344	0	16
E2K0	Artifact (B)	0	0	16
E2K1	Time (s)	217.421915	0	16
E2K1	Trajectory (B)	7344	0	16
E2K1	Artifact (B)	0	0	16
E2K2	Time (s)	218.145230	0	16
E2K2	Trajectory (B)	7344	0	16
E2K2	Artifact (B)	0	0	16

ALL DESCRIPTIVE CONTRASTS

Table 42: Study J, unicode index: all descriptive contrasts in fixed order; lower/upper are arithmetic missingness bounds, not confidence intervals.

Contrast	Point	Lower	Upper	U comp.
E0: K1 - K0	0.000000	0.000000	0.000000	0
E0: K2 - K0	0.000000	0.000000	0.000000	0
E0: K1 - K2	0.000000	0.000000	0.000000	0
E1: K1 - K0	0.000000	0.000000	0.000000	0
E1: K2 - K0	0.000000	0.000000	0.000000	0
E1: K1 - K2	0.000000	0.000000	0.000000	0
E2: K1 - K0	0.000000	0.000000	0.000000	0
E2: K2 - K0	0.000000	0.000000	0.000000	0
E2: K1 - K2	0.000000	0.000000	0.000000	0
K0: E1 - E0	0.000000	0.000000	0.000000	0
K0: E2 - E0	0.000000	0.000000	0.000000	0
K0: E2 - E1	0.000000	0.000000	0.000000	0
K1: E1 - E0	0.000000	0.000000	0.000000	0
K1: E2 - E0	0.000000	0.000000	0.000000	0
K1: E2 - E1	0.000000	0.000000	0.000000	0
K2: E1 - E0	0.000000	0.000000	0.000000	0
K2: E2 - E0	0.000000	0.000000	0.000000	0
K2: E2 - E1	0.000000	0.000000	0.000000	0
(E0 - E1): (K1 - K0)	0.000000	0.000000	0.000000	0
(E0 - E1): (K2 - K0)	0.000000	0.000000	0.000000	0
(E0 - E1): (K1 - K2)	0.000000	0.000000	0.000000	0
(E0 - E2): (K1 - K0)	0.000000	0.000000	0.000000	0
(E0 - E2): (K2 - K0)	0.000000	0.000000	0.000000	0
(E0 - E2): (K1 - K2)	0.000000	0.000000	0.000000	0
(E1 - E2): (K1 - K0)	0.000000	0.000000	0.000000	0
(E1 - E2): (K2 - K0)	0.000000	0.000000	0.000000	0
(E1 - E2): (K1 - K2)	0.000000	0.000000	0.000000	0

I.7 Route manifest

Complete execution

Table 43: Study J, route manifest: complete successes and arithmetic missingness bounds.

Cell	S	U	N	Point	Lower	Upper
E0K0	0	0	16	0.000000	0.000000	0.000000
E0K1	0	0	16	0.000000	0.000000	0.000000
E0K2	0	0	16	0.000000	0.000000	0.000000
E1K0	0	0	16	0.000000	0.000000	0.000000
E1K1	0	0	16	0.000000	0.000000	0.000000
E1K2	0	0	16	0.000000	0.000000	0.000000
E2K0	0	0	16	0.000000	0.000000	0.000000
E2K1	0	0	16	0.000000	0.000000	0.000000
E2K2	0	0	16	0.000000	0.000000	0.000000

Dependent target positions

Table 44: Study J, route manifest: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E0K0	1	0	0	16	0.000000	0.000000	0.000000
E0K0	2	0	0	16	0.000000	0.000000	0.000000
E0K0	3	0	0	16	0.000000	0.000000	0.000000
E0K0	4	0	0	16	0.000000	0.000000	0.000000
E0K1	1	0	0	16	0.000000	0.000000	0.000000
E0K1	2	0	0	16	0.000000	0.000000	0.000000
E0K1	3	0	0	16	0.000000	0.000000	0.000000
E0K1	4	0	0	16	0.000000	0.000000	0.000000
E0K2	1	0	0	16	0.000000	0.000000	0.000000
E0K2	2	0	0	16	0.000000	0.000000	0.000000
E0K2	3	0	0	16	0.000000	0.000000	0.000000
E0K2	4	0	0	16	0.000000	0.000000	0.000000
E1K0	1	0	0	16	0.000000	0.000000	0.000000
E1K0	2	0	0	16	0.000000	0.000000	0.000000
E1K0	3	0	0	16	0.000000	0.000000	0.000000
E1K0	4	0	0	16	0.000000	0.000000	0.000000
E1K1	1	0	0	16	0.000000	0.000000	0.000000
E1K1	2	0	0	16	0.000000	0.000000	0.000000
E1K1	3	0	0	16	0.000000	0.000000	0.000000
E1K1	4	0	0	16	0.000000	0.000000	0.000000
E1K2	1	0	0	16	0.000000	0.000000	0.000000
E1K2	2	0	0	16	0.000000	0.000000	0.000000
E1K2	3	0	0	16	0.000000	0.000000	0.000000
E1K2	4	0	0	16	0.000000	0.000000	0.000000
E2K0	1	0	0	16	0.000000	0.000000	0.000000
E2K0	2	0	0	16	0.000000	0.000000	0.000000
E2K0	3	0	0	16	0.000000	0.000000	0.000000
E2K0	4	0	0	16	0.000000	0.000000	0.000000

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Table 44 (continued): Study J, route manifest: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E2K1	1	0	0	16	0.000000	0.000000	0.000000
E2K1	2	0	0	16	0.000000	0.000000	0.000000
E2K1	3	0	0	16	0.000000	0.000000	0.000000
E2K1	4	0	0	16	0.000000	0.000000	0.000000
E2K2	1	0	0	16	0.000000	0.000000	0.000000
E2K2	2	0	0	16	0.000000	0.000000	0.000000
E2K2	3	0	0	16	0.000000	0.000000	0.000000
E2K2	4	0	0	16	0.000000	0.000000	0.000000

Failure and unknown categories

Table 45: Study J, route manifest: every registered failure and unknown category, including zeros.

Cell	C	I	M	A	T	P	R	U
E0K0	0	0	0	0	0	16	0	0
E0K1	0	0	0	0	0	16	0	0
E0K2	0	0	0	0	0	16	0	0
E1K0	0	0	0	0	0	16	0	0
E1K1	0	0	0	0	0	16	0	0
E1K2	0	0	0	0	0	16	0	0
E2K0	0	0	0	0	0	16	0	0
E2K1	0	0	0	0	0	16	0	0
E2K2	0	0	0	0	0	16	0	0

Recorded resources

Table 46: Study J, route manifest: recorded totals with unknown and planned opportunities retained; not comparative efficiency estimands.

Cell	Resource	Recorded total	U	N
E0K0	Time (s)	230.020515	0	16
E0K0	Trajectory (B)	7344	0	16
E0K0	Artifact (B)	0	0	16
E0K1	Time (s)	232.230503	0	16
E0K1	Trajectory (B)	7344	0	16
E0K1	Artifact (B)	0	0	16
E0K2	Time (s)	225.528112	0	16
E0K2	Trajectory (B)	7344	0	16
E0K2	Artifact (B)	0	0	16
E1K0	Time (s)	237.247268	0	16
E1K0	Trajectory (B)	7344	0	16
E1K0	Artifact (B)	0	0	16
E1K1	Time (s)	234.585820	0	16
E1K1	Trajectory (B)	7344	0	16
E1K1	Artifact (B)	0	0	16

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Table 46 (continued): Study J, route manifest: recorded totals with unknown and planned opportunities retained; not comparative efficiency estimands.

Cell	Resource	Recorded total	U	N
E1K2	Time (s)	230.693074	0	16
E1K2	Trajectory (B)	7344	0	16
E1K2	Artifact (B)	0	0	16
E2K0	Time (s)	234.144753	0	16
E2K0	Trajectory (B)	7344	0	16
E2K0	Artifact (B)	0	0	16
E2K1	Time (s)	230.832227	0	16
E2K1	Trajectory (B)	7344	0	16
E2K1	Artifact (B)	0	0	16
E2K2	Time (s)	233.554666	0	16
E2K2	Trajectory (B)	7540	0	16
E2K2	Artifact (B)	0	0	16

All descriptive contrasts

Table 47: Study J, route manifest: all descriptive contrasts in fixed order; lower/upper are arithmetic missingness bounds, not confidence intervals.

Contrast	Point	Lower	Upper	U comp.
E0: K1 - K0	0.000000	0.000000	0.000000	0
E0: K2 - K0	0.000000	0.000000	0.000000	0
E0: K1 - K2	0.000000	0.000000	0.000000	0
E1: K1 - K0	0.000000	0.000000	0.000000	0
E1: K2 - K0	0.000000	0.000000	0.000000	0
E1: K1 - K2	0.000000	0.000000	0.000000	0
E2: K1 - K0	0.000000	0.000000	0.000000	0
E2: K2 - K0	0.000000	0.000000	0.000000	0
E2: K1 - K2	0.000000	0.000000	0.000000	0
K0: E1 - E0	0.000000	0.000000	0.000000	0
K0: E2 - E0	0.000000	0.000000	0.000000	0
K0: E2 - E1	0.000000	0.000000	0.000000	0
K1: E1 - E0	0.000000	0.000000	0.000000	0
K1: E2 - E0	0.000000	0.000000	0.000000	0
K1: E2 - E1	0.000000	0.000000	0.000000	0
K2: E1 - E0	0.000000	0.000000	0.000000	0
K2: E2 - E0	0.000000	0.000000	0.000000	0
K2: E2 - E1	0.000000	0.000000	0.000000	0
(E0 - E1): (K1 - K0)	0.000000	0.000000	0.000000	0
(E0 - E1): (K2 - K0)	0.000000	0.000000	0.000000	0
(E0 - E1): (K1 - K2)	0.000000	0.000000	0.000000	0
(E0 - E2): (K1 - K0)	0.000000	0.000000	0.000000	0
(E0 - E2): (K2 - K0)	0.000000	0.000000	0.000000	0
(E0 - E2): (K1 - K2)	0.000000	0.000000	0.000000	0
(E1 - E2): (K1 - K0)	0.000000	0.000000	0.000000	0
(E1 - E2): (K2 - K0)	0.000000	0.000000	0.000000	0
(E1 - E2): (K1 - K2)	0.000000	0.000000	0.000000	0

I.8 Grouped nullable counts

Complete execution

Table 48: Study J, grouped nullable counts: complete successes and arithmetic missingness bounds.

Cell	S	U	N	Point	Lower	Upper
E0K0	0	0	16	0.000000	0.000000	0.000000
E0K1	0	0	16	0.000000	0.000000	0.000000
E0K2	0	0	16	0.000000	0.000000	0.000000
E1K0	0	0	16	0.000000	0.000000	0.000000
E1K1	0	0	16	0.000000	0.000000	0.000000
E1K2	0	0	16	0.000000	0.000000	0.000000
E2K0	0	0	16	0.000000	0.000000	0.000000
E2K1	0	0	16	0.000000	0.000000	0.000000
E2K2	0	0	16	0.000000	0.000000	0.000000

Dependent target positions

Table 49: Study J, grouped nullable counts: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E0K0	1	0	0	16	0.000000	0.000000	0.000000
E0K0	2	0	0	16	0.000000	0.000000	0.000000
E0K0	3	0	0	16	0.000000	0.000000	0.000000
E0K0	4	0	0	16	0.000000	0.000000	0.000000
E0K1	1	0	0	16	0.000000	0.000000	0.000000
E0K1	2	0	0	16	0.000000	0.000000	0.000000
E0K1	3	0	0	16	0.000000	0.000000	0.000000
E0K1	4	0	0	16	0.000000	0.000000	0.000000
E0K2	1	0	0	16	0.000000	0.000000	0.000000
E0K2	2	0	0	16	0.000000	0.000000	0.000000
E0K2	3	0	0	16	0.000000	0.000000	0.000000
E0K2	4	0	0	16	0.000000	0.000000	0.000000
E1K0	1	0	0	16	0.000000	0.000000	0.000000
E1K0	2	0	0	16	0.000000	0.000000	0.000000
E1K0	3	0	0	16	0.000000	0.000000	0.000000
E1K0	4	0	0	16	0.000000	0.000000	0.000000
E1K1	1	0	0	16	0.000000	0.000000	0.000000
E1K1	2	0	0	16	0.000000	0.000000	0.000000
E1K1	3	0	0	16	0.000000	0.000000	0.000000
E1K1	4	0	0	16	0.000000	0.000000	0.000000
E1K2	1	0	0	16	0.000000	0.000000	0.000000
E1K2	2	0	0	16	0.000000	0.000000	0.000000
E1K2	3	0	0	16	0.000000	0.000000	0.000000
E1K2	4	0	0	16	0.000000	0.000000	0.000000
E2K0	1	0	0	16	0.000000	0.000000	0.000000
E2K0	2	0	0	16	0.000000	0.000000	0.000000
E2K0	3	0	0	16	0.000000	0.000000	0.000000
E2K0	4	0	0	16	0.000000	0.000000	0.000000

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Table 49 (continued): Study J, grouped nullable counts: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E2K1	1	0	0	16	0.000000	0.000000	0.000000
E2K1	2	0	0	16	0.000000	0.000000	0.000000
E2K1	3	0	0	16	0.000000	0.000000	0.000000
E2K1	4	0	0	16	0.000000	0.000000	0.000000
E2K2	1	0	0	16	0.000000	0.000000	0.000000
E2K2	2	0	0	16	0.000000	0.000000	0.000000
E2K2	3	0	0	16	0.000000	0.000000	0.000000
E2K2	4	0	0	16	0.000000	0.000000	0.000000

Failure and unknown categories

Table 50: Study J, grouped nullable counts: every registered failure and unknown category, including zeros.

Cell	C	I	M	A	T	P	R	U
E0K0	0	0	0	0	0	16	0	0
E0K1	0	0	0	0	0	16	0	0
E0K2	0	0	0	0	0	16	0	0
E1K0	0	0	0	0	0	16	0	0
E1K1	0	0	0	0	0	16	0	0
E1K2	0	0	0	0	0	16	0	0
E2K0	0	0	0	0	0	16	0	0
E2K1	0	0	0	0	0	16	0	0
E2K2	0	0	0	0	0	16	0	0

Recorded resources

Table 51: Study J, grouped nullable counts: recorded totals with unknown and planned opportunities retained; not comparative efficiency estimands.

Cell	Resource	Recorded total	U	N
E0K0	Time (s)	248.730772	0	16
E0K0	Trajectory (B)	7344	0	16
E0K0	Artifact (B)	0	0	16
E0K1	Time (s)	245.224825	0	16
E0K1	Trajectory (B)	7344	0	16
E0K1	Artifact (B)	0	0	16
E0K2	Time (s)	246.626396	0	16
E0K2	Trajectory (B)	7344	0	16
E0K2	Artifact (B)	0	0	16
E1K0	Time (s)	248.041423	0	16
E1K0	Trajectory (B)	7344	0	16
E1K0	Artifact (B)	0	0	16
E1K1	Time (s)	251.202229	0	16
E1K1	Trajectory (B)	7344	0	16
E1K1	Artifact (B)	0	0	16

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Table 51 (continued): Study J, grouped nullable counts: recorded totals with unknown and planned opportunities retained; not comparative efficiency estimands.

Cell	Resource	Recorded total	U	N
E1K2	Time (s)	248.027021	0	16
E1K2	Trajectory (B)	7344	0	16
E1K2	Artifact (B)	0	0	16
E2K0	Time (s)	248.768254	0	16
E2K0	Trajectory (B)	7344	0	16
E2K0	Artifact (B)	0	0	16
E2K1	Time (s)	248.343793	0	16
E2K1	Trajectory (B)	7487	0	16
E2K1	Artifact (B)	0	0	16
E2K2	Time (s)	247.318195	0	16
E2K2	Trajectory (B)	7344	0	16
E2K2	Artifact (B)	0	0	16

All descriptive contrasts

Table 52: Study J, grouped nullable counts: all descriptive contrasts in fixed order; lower/upper are arithmetic missingness bounds, not confidence intervals.

Contrast	Point	Lower	Upper	U comp.
E0: K1 - K0	0.000000	0.000000	0.000000	0
E0: K2 - K0	0.000000	0.000000	0.000000	0
E0: K1 - K2	0.000000	0.000000	0.000000	0
E1: K1 - K0	0.000000	0.000000	0.000000	0
E1: K2 - K0	0.000000	0.000000	0.000000	0
E1: K1 - K2	0.000000	0.000000	0.000000	0
E2: K1 - K0	0.000000	0.000000	0.000000	0
E2: K2 - K0	0.000000	0.000000	0.000000	0
E2: K1 - K2	0.000000	0.000000	0.000000	0
K0: E1 - E0	0.000000	0.000000	0.000000	0
K0: E2 - E0	0.000000	0.000000	0.000000	0
K0: E2 - E1	0.000000	0.000000	0.000000	0
K1: E1 - E0	0.000000	0.000000	0.000000	0
K1: E2 - E0	0.000000	0.000000	0.000000	0
K1: E2 - E1	0.000000	0.000000	0.000000	0
K2: E1 - E0	0.000000	0.000000	0.000000	0
K2: E2 - E0	0.000000	0.000000	0.000000	0
K2: E2 - E1	0.000000	0.000000	0.000000	0
(E0 - E1): (K1 - K0)	0.000000	0.000000	0.000000	0
(E0 - E1): (K2 - K0)	0.000000	0.000000	0.000000	0
(E0 - E1): (K1 - K2)	0.000000	0.000000	0.000000	0
(E0 - E2): (K1 - K0)	0.000000	0.000000	0.000000	0
(E0 - E2): (K2 - K0)	0.000000	0.000000	0.000000	0
(E0 - E2): (K1 - K2)	0.000000	0.000000	0.000000	0
(E1 - E2): (K1 - K0)	0.000000	0.000000	0.000000	0
(E1 - E2): (K2 - K0)	0.000000	0.000000	0.000000	0
(E1 - E2): (K1 - K2)	0.000000	0.000000	0.000000	0

I.9 Checksum manifest

Complete execution

Table 53: Study J, checksum manifest: complete successes and arithmetic missingness bounds.

Cell	S	U	N	Point	Lower	Upper
E0K0	0	0	16	0.000000	0.000000	0.000000
E0K1	0	0	16	0.000000	0.000000	0.000000
E0K2	0	0	16	0.000000	0.000000	0.000000
E1K0	0	0	16	0.000000	0.000000	0.000000
E1K1	0	0	16	0.000000	0.000000	0.000000
E1K2	0	0	16	0.000000	0.000000	0.000000
E2K0	0	0	16	0.000000	0.000000	0.000000
E2K1	0	0	16	0.000000	0.000000	0.000000
E2K2	0	0	16	0.000000	0.000000	0.000000

Dependent target positions

Table 54: Study J, checksum manifest: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E0K0	1	0	0	16	0.000000	0.000000	0.000000
E0K0	2	0	0	16	0.000000	0.000000	0.000000
E0K0	3	0	0	16	0.000000	0.000000	0.000000
E0K0	4	0	0	16	0.000000	0.000000	0.000000
E0K1	1	0	0	16	0.000000	0.000000	0.000000
E0K1	2	0	0	16	0.000000	0.000000	0.000000
E0K1	3	0	0	16	0.000000	0.000000	0.000000
E0K1	4	0	0	16	0.000000	0.000000	0.000000
E0K2	1	0	0	16	0.000000	0.000000	0.000000
E0K2	2	0	0	16	0.000000	0.000000	0.000000
E0K2	3	0	0	16	0.000000	0.000000	0.000000
E0K2	4	0	0	16	0.000000	0.000000	0.000000
E1K0	1	0	0	16	0.000000	0.000000	0.000000
E1K0	2	0	0	16	0.000000	0.000000	0.000000
E1K0	3	0	0	16	0.000000	0.000000	0.000000
E1K0	4	0	0	16	0.000000	0.000000	0.000000
E1K1	1	0	0	16	0.000000	0.000000	0.000000
E1K1	2	0	0	16	0.000000	0.000000	0.000000
E1K1	3	0	0	16	0.000000	0.000000	0.000000
E1K1	4	0	0	16	0.000000	0.000000	0.000000
E1K2	1	0	0	16	0.000000	0.000000	0.000000
E1K2	2	0	0	16	0.000000	0.000000	0.000000
E1K2	3	0	0	16	0.000000	0.000000	0.000000
E1K2	4	0	0	16	0.000000	0.000000	0.000000
E2K0	1	0	0	16	0.000000	0.000000	0.000000
E2K0	2	0	0	16	0.000000	0.000000	0.000000
E2K0	3	0	0	16	0.000000	0.000000	0.000000
E2K0	4	0	0	16	0.000000	0.000000	0.000000

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Table 54 (continued): Study J, checksum manifest: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E2K1	1	0	0	16	0.000000	0.000000	0.000000
E2K1	2	0	0	16	0.000000	0.000000	0.000000
E2K1	3	0	0	16	0.000000	0.000000	0.000000
E2K1	4	0	0	16	0.000000	0.000000	0.000000
E2K2	1	0	0	16	0.000000	0.000000	0.000000
E2K2	2	0	0	16	0.000000	0.000000	0.000000
E2K2	3	0	0	16	0.000000	0.000000	0.000000
E2K2	4	0	0	16	0.000000	0.000000	0.000000

Failure and unknown categories

Table 55: Study J, checksum manifest: every registered failure and unknown category, including zeros.

Cell	C	I	M	A	T	P	R	U
E0K0	0	0	0	0	0	16	0	0
E0K1	0	0	0	0	0	16	0	0
E0K2	0	0	0	0	0	16	0	0
E1K0	0	0	0	0	0	16	0	0
E1K1	0	0	0	0	0	16	0	0
E1K2	0	0	0	0	0	16	0	0
E2K0	0	0	0	0	0	16	0	0
E2K1	0	0	0	0	0	16	0	0
E2K2	0	0	0	0	0	16	0	0

Recorded resources

Table 56: Study J, checksum manifest: recorded totals with unknown and planned opportunities retained; not comparative efficiency estimands.

Cell	Resource	Recorded total	U	N
E0K0	Time (s)	335.726912	0	16
E0K0	Trajectory (B)	9918	0	16
E0K0	Artifact (B)	0	0	16
E0K1	Time (s)	337.555435	0	16
E0K1	Trajectory (B)	9775	0	16
E0K1	Artifact (B)	0	0	16
E0K2	Time (s)	334.401953	0	16
E0K2	Trajectory (B)	9775	0	16
E0K2	Artifact (B)	0	0	16
E1K0	Time (s)	332.748377	0	16
E1K0	Trajectory (B)	9632	0	16
E1K0	Artifact (B)	0	0	16
E1K1	Time (s)	337.889121	0	16
E1K1	Trajectory (B)	9775	0	16
E1K1	Artifact (B)	0	0	16

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Table 56 (continued): Study J, checksum manifest: recorded totals with unknown and planned opportunities retained; not comparative efficiency estimands.

Cell	Resource	Recorded total	U	N
E1K2	Time (s)	334.504111	0	16
E1K2	Trajectory (B)	9632	0	16
E1K2	Artifact (B)	0	0	16
E2K0	Time (s)	336.728727	0	16
E2K0	Trajectory (B)	9632	0	16
E2K0	Artifact (B)	0	0	16
E2K1	Time (s)	334.433033	0	16
E2K1	Trajectory (B)	9346	0	16
E2K1	Artifact (B)	0	0	16
E2K2	Time (s)	331.570093	0	16
E2K2	Trajectory (B)	9775	0	16
E2K2	Artifact (B)	0	0	16

ALL DESCRIPTIVE CONTRASTS

Table 57: Study J, checksum manifest: all descriptive contrasts in fixed order; lower/upper are arithmetic missingness bounds, not confidence intervals.

Contrast	Point	Lower	Upper	U comp.
E0: K1 - K0	0.000000	0.000000	0.000000	0
E0: K2 - K0	0.000000	0.000000	0.000000	0
E0: K1 - K2	0.000000	0.000000	0.000000	0
E1: K1 - K0	0.000000	0.000000	0.000000	0
E1: K2 - K0	0.000000	0.000000	0.000000	0
E1: K1 - K2	0.000000	0.000000	0.000000	0
E2: K1 - K0	0.000000	0.000000	0.000000	0
E2: K2 - K0	0.000000	0.000000	0.000000	0
E2: K1 - K2	0.000000	0.000000	0.000000	0
K0: E1 - E0	0.000000	0.000000	0.000000	0
K0: E2 - E0	0.000000	0.000000	0.000000	0
K0: E2 - E1	0.000000	0.000000	0.000000	0
K1: E1 - E0	0.000000	0.000000	0.000000	0
K1: E2 - E0	0.000000	0.000000	0.000000	0
K1: E2 - E1	0.000000	0.000000	0.000000	0
K2: E1 - E0	0.000000	0.000000	0.000000	0
K2: E2 - E0	0.000000	0.000000	0.000000	0
K2: E2 - E1	0.000000	0.000000	0.000000	0
(E0 - E1): (K1 - K0)	0.000000	0.000000	0.000000	0
(E0 - E1): (K2 - K0)	0.000000	0.000000	0.000000	0
(E0 - E1): (K1 - K2)	0.000000	0.000000	0.000000	0
(E0 - E2): (K1 - K0)	0.000000	0.000000	0.000000	0
(E0 - E2): (K2 - K0)	0.000000	0.000000	0.000000	0
(E0 - E2): (K1 - K2)	0.000000	0.000000	0.000000	0
(E1 - E2): (K1 - K0)	0.000000	0.000000	0.000000	0
(E1 - E2): (K2 - K0)	0.000000	0.000000	0.000000	0
(E1 - E2): (K1 - K2)	0.000000	0.000000	0.000000	0

I.10 Asset selection

Complete execution

Table 58: Study J, asset selection: complete successes and arithmetic missingness bounds.

Cell	S	U	N	Point	Lower	Upper
E0K0	0	0	16	0.000000	0.000000	0.000000
E0K1	0	0	16	0.000000	0.000000	0.000000
E0K2	0	0	16	0.000000	0.000000	0.000000
E1K0	0	0	16	0.000000	0.000000	0.000000
E1K1	0	0	16	0.000000	0.000000	0.000000
E1K2	0	0	16	0.000000	0.000000	0.000000
E2K0	0	0	16	0.000000	0.000000	0.000000
E2K1	0	0	16	0.000000	0.000000	0.000000
E2K2	0	0	16	0.000000	0.000000	0.000000

Dependent target positions

Table 59: Study J, asset selection: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E0K0	1	0	0	16	0.000000	0.000000	0.000000
E0K0	2	0	0	16	0.000000	0.000000	0.000000
E0K0	3	0	0	16	0.000000	0.000000	0.000000
E0K0	4	0	0	16	0.000000	0.000000	0.000000
E0K1	1	0	0	16	0.000000	0.000000	0.000000
E0K1	2	0	0	16	0.000000	0.000000	0.000000
E0K1	3	0	0	16	0.000000	0.000000	0.000000
E0K1	4	0	0	16	0.000000	0.000000	0.000000
E0K2	1	0	0	16	0.000000	0.000000	0.000000
E0K2	2	0	0	16	0.000000	0.000000	0.000000
E0K2	3	0	0	16	0.000000	0.000000	0.000000
E0K2	4	0	0	16	0.000000	0.000000	0.000000
E1K0	1	0	0	16	0.000000	0.000000	0.000000
E1K0	2	0	0	16	0.000000	0.000000	0.000000
E1K0	3	0	0	16	0.000000	0.000000	0.000000
E1K0	4	0	0	16	0.000000	0.000000	0.000000
E1K1	1	0	0	16	0.000000	0.000000	0.000000
E1K1	2	0	0	16	0.000000	0.000000	0.000000
E1K1	3	0	0	16	0.000000	0.000000	0.000000
E1K1	4	0	0	16	0.000000	0.000000	0.000000
E1K2	1	0	0	16	0.000000	0.000000	0.000000
E1K2	2	0	0	16	0.000000	0.000000	0.000000
E1K2	3	0	0	16	0.000000	0.000000	0.000000
E1K2	4	0	0	16	0.000000	0.000000	0.000000
E2K0	1	0	0	16	0.000000	0.000000	0.000000
E2K0	2	0	0	16	0.000000	0.000000	0.000000
E2K0	3	0	0	16	0.000000	0.000000	0.000000
E2K0	4	0	0	16	0.000000	0.000000	0.000000

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Table 59 (continued): Study J, asset selection: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E2K1	1	0	0	16	0.000000	0.000000	0.000000
E2K1	2	0	0	16	0.000000	0.000000	0.000000
E2K1	3	0	0	16	0.000000	0.000000	0.000000
E2K1	4	0	0	16	0.000000	0.000000	0.000000
E2K2	1	0	0	16	0.000000	0.000000	0.000000
E2K2	2	0	0	16	0.000000	0.000000	0.000000
E2K2	3	0	0	16	0.000000	0.000000	0.000000
E2K2	4	0	0	16	0.000000	0.000000	0.000000

Failure and unknown categories

Table 60: Study J, asset selection: every registered failure and unknown category, including zeros.

Cell	C	I	M	A	T	P	R	U
E0K0	0	0	0	0	0	16	0	0
E0K1	0	0	0	0	0	16	0	0
E0K2	0	0	0	0	0	16	0	0
E1K0	0	0	0	0	0	16	0	0
E1K1	0	0	0	0	0	16	0	0
E1K2	0	0	0	0	0	16	0	0
E2K0	0	0	0	0	0	16	0	0
E2K1	0	0	0	0	0	16	0	0
E2K2	0	0	0	0	0	16	0	0

Recorded resources

Table 61: Study J, asset selection: recorded totals with unknown and planned opportunities retained; not comparative efficiency estimands.

Cell	Resource	Recorded total	U	N
E0K0	Time (s)	325.583259	0	16
E0K0	Trajectory (B)	7344	0	16
E0K0	Artifact (B)	0	0	16
E0K1	Time (s)	327.299852	0	16
E0K1	Trajectory (B)	7344	0	16
E0K1	Artifact (B)	0	0	16
E0K2	Time (s)	325.445397	0	16
E0K2	Trajectory (B)	7344	0	16
E0K2	Artifact (B)	0	0	16
E1K0	Time (s)	327.544141	0	16
E1K0	Trajectory (B)	7344	0	16
E1K0	Artifact (B)	0	0	16
E1K1	Time (s)	327.171210	0	16
E1K1	Trajectory (B)	7487	0	16
E1K1	Artifact (B)	0	0	16

Continued on next page

Table 61 (continued): Study J, asset selection: recorded totals with unknown and planned opportunities retained; not comparative efficiency estimands.

Cell	Resource	Recorded total	U	N
E1K2	Time (s)	327.458244	0	16
E1K2	Trajectory (B)	7344	0	16
E1K2	Artifact (B)	0	0	16
E2K0	Time (s)	329.947745	0	16
E2K0	Trajectory (B)	7487	0	16
E2K0	Artifact (B)	0	0	16
E2K1	Time (s)	323.962390	0	16
E2K1	Trajectory (B)	7344	0	16
E2K1	Artifact (B)	0	0	16
E2K2	Time (s)	321.272368	0	16
E2K2	Trajectory (B)	7630	0	16
E2K2	Artifact (B)	0	0	16

ALL DESCRIPTIVE CONTRASTS

Table 62: Study J, asset selection: all descriptive contrasts in fixed order; lower/upper are arithmetic missingness bounds, not confidence intervals.

Contrast	Point	Lower	Upper	U comp.
E0: K1 - K0	0.000000	0.000000	0.000000	0
E0: K2 - K0	0.000000	0.000000	0.000000	0
E0: K1 - K2	0.000000	0.000000	0.000000	0
E1: K1 - K0	0.000000	0.000000	0.000000	0
E1: K2 - K0	0.000000	0.000000	0.000000	0
E1: K1 - K2	0.000000	0.000000	0.000000	0
E2: K1 - K0	0.000000	0.000000	0.000000	0
E2: K2 - K0	0.000000	0.000000	0.000000	0
E2: K1 - K2	0.000000	0.000000	0.000000	0
K0: E1 - E0	0.000000	0.000000	0.000000	0
K0: E2 - E0	0.000000	0.000000	0.000000	0
K0: E2 - E1	0.000000	0.000000	0.000000	0
K1: E1 - E0	0.000000	0.000000	0.000000	0
K1: E2 - E0	0.000000	0.000000	0.000000	0
K1: E2 - E1	0.000000	0.000000	0.000000	0
K2: E1 - E0	0.000000	0.000000	0.000000	0
K2: E2 - E0	0.000000	0.000000	0.000000	0
K2: E2 - E1	0.000000	0.000000	0.000000	0
(E0 - E1): (K1 - K0)	0.000000	0.000000	0.000000	0
(E0 - E1): (K2 - K0)	0.000000	0.000000	0.000000	0
(E0 - E1): (K1 - K2)	0.000000	0.000000	0.000000	0
(E0 - E2): (K1 - K0)	0.000000	0.000000	0.000000	0
(E0 - E2): (K2 - K0)	0.000000	0.000000	0.000000	0
(E0 - E2): (K1 - K2)	0.000000	0.000000	0.000000	0
(E1 - E2): (K1 - K0)	0.000000	0.000000	0.000000	0
(E1 - E2): (K2 - K0)	0.000000	0.000000	0.000000	0
(E1 - E2): (K1 - K2)	0.000000	0.000000	0.000000	0

I.11 Csv export, orientation 0

Complete execution

Table 63: Study J, csv export, orientation 0: complete successes and arithmetic missingness bounds.

Cell	S	U	N	Point	Lower	Upper
E0K0	7	0	8	0.875000	0.875000	0.875000
E0K1	6	0	8	0.750000	0.750000	0.750000
E0K2	0	0	8	0.000000	0.000000	0.000000
E1K0	8	0	8	1.000000	1.000000	1.000000
E1K1	8	0	8	1.000000	1.000000	1.000000
E1K2	2	0	8	0.250000	0.250000	0.250000
E2K0	7	0	8	0.875000	0.875000	0.875000
E2K1	8	0	8	1.000000	1.000000	1.000000
E2K2	6	0	8	0.750000	0.750000	0.750000

Dependent target positions

Table 64: Study J, csv export, orientation 0: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E0K0	1	8	0	8	1.000000	1.000000	1.000000
E0K0	2	8	0	8	1.000000	1.000000	1.000000
E0K0	3	8	0	8	1.000000	1.000000	1.000000
E0K0	4	7	0	8	0.875000	0.875000	0.875000
E0K1	1	7	0	8	0.875000	0.875000	0.875000
E0K1	2	7	0	8	0.875000	0.875000	0.875000
E0K1	3	7	0	8	0.875000	0.875000	0.875000
E0K1	4	6	0	8	0.750000	0.750000	0.750000
E0K2	1	0	0	8	0.000000	0.000000	0.000000
E0K2	2	0	0	8	0.000000	0.000000	0.000000
E0K2	3	0	0	8	0.000000	0.000000	0.000000
E0K2	4	0	0	8	0.000000	0.000000	0.000000
E1K0	1	8	0	8	1.000000	1.000000	1.000000
E1K0	2	8	0	8	1.000000	1.000000	1.000000
E1K0	3	8	0	8	1.000000	1.000000	1.000000
E1K0	4	8	0	8	1.000000	1.000000	1.000000
E1K1	1	8	0	8	1.000000	1.000000	1.000000
E1K1	2	8	0	8	1.000000	1.000000	1.000000
E1K1	3	8	0	8	1.000000	1.000000	1.000000
E1K1	4	8	0	8	1.000000	1.000000	1.000000
E1K2	1	2	0	8	0.250000	0.250000	0.250000
E1K2	2	2	0	8	0.250000	0.250000	0.250000
E1K2	3	2	0	8	0.250000	0.250000	0.250000
E1K2	4	2	0	8	0.250000	0.250000	0.250000
E2K0	1	8	0	8	1.000000	1.000000	1.000000
E2K0	2	8	0	8	1.000000	1.000000	1.000000
E2K0	3	8	0	8	1.000000	1.000000	1.000000
E2K0	4	7	0	8	0.875000	0.875000	0.875000

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Table 64 (continued): Study J, csv export, orientation 0: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E2K1	1	8	0	8	1.000000	1.000000	1.000000
E2K1	2	8	0	8	1.000000	1.000000	1.000000
E2K1	3	8	0	8	1.000000	1.000000	1.000000
E2K1	4	8	0	8	1.000000	1.000000	1.000000
E2K2	1	7	0	8	0.875000	0.875000	0.875000
E2K2	2	7	0	8	0.875000	0.875000	0.875000
E2K2	3	7	0	8	0.875000	0.875000	0.875000
E2K2	4	6	0	8	0.750000	0.750000	0.750000

Failure and unknown categories

Table 65: Study J, csv export, orientation 0: every registered failure and unknown category, including zeros.

Cell	C	I	M	A	T	P	R	U
E0K0	7	1	0	0	0	0	0	0
E0K1	6	1	1	0	0	0	0	0
E0K2	0	8	0	0	0	0	0	0
E1K0	8	0	0	0	0	0	0	0
E1K1	8	0	0	0	0	0	0	0
E1K2	2	6	0	0	0	0	0	0
E2K0	7	1	0	0	0	0	0	0
E2K1	8	0	0	0	0	0	0	0
E2K2	6	1	1	0	0	0	0	0

Recorded resources

Table 66: Study J, csv export, orientation 0: recorded totals with unknown and planned opportunities retained; not comparative efficiency estimands.

Cell	Resource	Recorded total	U	N
E0K0	Time (s)	903.722790	0	8
E0K0	Trajectory (B)	249334	0	8
E0K0	Artifact (B)	17240	0	8
E0K1	Time (s)	709.484060	0	8
E0K1	Trajectory (B)	223991	0	8
E0K1	Artifact (B)	17235	0	8
E0K2	Time (s)	1431.868069	0	8
E0K2	Trajectory (B)	326451	0	8
E0K2	Artifact (B)	17460	0	8
E1K0	Time (s)	945.599730	0	8
E1K0	Trajectory (B)	245165	0	8
E1K0	Artifact (B)	17235	0	8
E1K1	Time (s)	760.814921	0	8
E1K1	Trajectory (B)	244622	0	8
E1K1	Artifact (B)	17235	0	8

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Table 66 (continued): Study J, csv export, orientation 0: recorded totals with unknown and planned opportunities retained; not comparative efficiency estimands.

Cell	Resource	Recorded total	U	N
E1K2	Time (s)	1356.607420	0	8
E1K2	Trajectory (B)	284509	0	8
E1K2	Artifact (B)	17322	0	8
E2K0	Time (s)	924.735100	0	8
E2K0	Trajectory (B)	267424	0	8
E2K0	Artifact (B)	17236	0	8
E2K1	Time (s)	872.049249	0	8
E2K1	Trajectory (B)	258717	0	8
E2K1	Artifact (B)	17235	0	8
E2K2	Time (s)	884.240355	0	8
E2K2	Trajectory (B)	233115	0	8
E2K2	Artifact (B)	17235	0	8

ALL DESCRIPTIVE CONTRASTS

Table 67: Study J, csv export, orientation 0: all descriptive contrasts in fixed order; lower/upper are arithmetic missingness bounds, not confidence intervals.

Contrast	Point	Lower	Upper	U comp.
E0: K1 - K0	-0.125000	-0.125000	-0.125000	0
E0: K2 - K0	-0.875000	-0.875000	-0.875000	0
E0: K1 - K2	0.750000	0.750000	0.750000	0
E1: K1 - K0	0.000000	0.000000	0.000000	0
E1: K2 - K0	-0.750000	-0.750000	-0.750000	0
E1: K1 - K2	0.750000	0.750000	0.750000	0
E2: K1 - K0	0.125000	0.125000	0.125000	0
E2: K2 - K0	-0.125000	-0.125000	-0.125000	0
E2: K1 - K2	0.250000	0.250000	0.250000	0
K0: E1 - E0	0.125000	0.125000	0.125000	0
K0: E2 - E0	0.000000	0.000000	0.000000	0
K0: E2 - E1	-0.125000	-0.125000	-0.125000	0
K1: E1 - E0	0.250000	0.250000	0.250000	0
K1: E2 - E0	0.250000	0.250000	0.250000	0
K1: E2 - E1	0.000000	0.000000	0.000000	0
K2: E1 - E0	0.250000	0.250000	0.250000	0
K2: E2 - E0	0.750000	0.750000	0.750000	0
K2: E2 - E1	0.500000	0.500000	0.500000	0
(E0 - E1): (K1 - K0)	-0.125000	-0.125000	-0.125000	0
(E0 - E1): (K2 - K0)	-0.125000	-0.125000	-0.125000	0
(E0 - E1): (K1 - K2)	0.000000	0.000000	0.000000	0
(E0 - E2): (K1 - K0)	-0.250000	-0.250000	-0.250000	0
(E0 - E2): (K2 - K0)	-0.750000	-0.750000	-0.750000	0
(E0 - E2): (K1 - K2)	0.500000	0.500000	0.500000	0
(E1 - E2): (K1 - K0)	-0.125000	-0.125000	-0.125000	0
(E1 - E2): (K2 - K0)	-0.625000	-0.625000	-0.625000	0
(E1 - E2): (K1 - K2)	0.500000	0.500000	0.500000	0

I.12 Csv export, orientation 1

Complete execution

Table 68: Study J, csv export, orientation 1: complete successes and arithmetic missingness bounds.

Cell	S	U	N	Point	Lower	Upper
E0K0	0	0	8	0.000000	0.000000	0.000000
E0K1	5	0	8	0.625000	0.625000	0.625000
E0K2	0	0	8	0.000000	0.000000	0.000000
E1K0	7	0	8	0.875000	0.875000	0.875000
E1K1	7	0	8	0.875000	0.875000	0.875000
E1K2	1	0	8	0.125000	0.125000	0.125000
E2K0	7	0	8	0.875000	0.875000	0.875000
E2K1	6	0	8	0.750000	0.750000	0.750000
E2K2	5	0	8	0.625000	0.625000	0.625000

Dependent target positions

Table 69: Study J, csv export, orientation 1: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E0K0	1	0	0	8	0.000000	0.000000	0.000000
E0K0	2	0	0	8	0.000000	0.000000	0.000000
E0K0	3	0	0	8	0.000000	0.000000	0.000000
E0K0	4	0	0	8	0.000000	0.000000	0.000000
E0K1	1	7	0	8	0.875000	0.875000	0.875000
E0K1	2	7	0	8	0.875000	0.875000	0.875000
E0K1	3	5	0	8	0.625000	0.625000	0.625000
E0K1	4	5	0	8	0.625000	0.625000	0.625000
E0K2	1	0	0	8	0.000000	0.000000	0.000000
E0K2	2	0	0	8	0.000000	0.000000	0.000000
E0K2	3	0	0	8	0.000000	0.000000	0.000000
E0K2	4	0	0	8	0.000000	0.000000	0.000000
E1K0	1	8	0	8	1.000000	1.000000	1.000000
E1K0	2	8	0	8	1.000000	1.000000	1.000000
E1K0	3	8	0	8	1.000000	1.000000	1.000000
E1K0	4	7	0	8	0.875000	0.875000	0.875000
E1K1	1	7	0	8	0.875000	0.875000	0.875000
E1K1	2	7	0	8	0.875000	0.875000	0.875000
E1K1	3	7	0	8	0.875000	0.875000	0.875000
E1K1	4	7	0	8	0.875000	0.875000	0.875000
E1K2	1	1	0	8	0.125000	0.125000	0.125000
E1K2	2	1	0	8	0.125000	0.125000	0.125000
E1K2	3	1	0	8	0.125000	0.125000	0.125000
E1K2	4	1	0	8	0.125000	0.125000	0.125000
E2K0	1	7	0	8	0.875000	0.875000	0.875000
E2K0	2	7	0	8	0.875000	0.875000	0.875000
E2K0	3	7	0	8	0.875000	0.875000	0.875000
E2K0	4	7	0	8	0.875000	0.875000	0.875000

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Table 69 (continued): Study J, csv export, orientation 1: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E2K1	1	7	0	8	0.875000	0.875000	0.875000
E2K1	2	7	0	8	0.875000	0.875000	0.875000
E2K1	3	7	0	8	0.875000	0.875000	0.875000
E2K1	4	6	0	8	0.750000	0.750000	0.750000
E2K2	1	6	0	8	0.750000	0.750000	0.750000
E2K2	2	6	0	8	0.750000	0.750000	0.750000
E2K2	3	5	0	8	0.625000	0.625000	0.625000
E2K2	4	5	0	8	0.625000	0.625000	0.625000

Failure and unknown categories

Table 70: Study J, csv export, orientation 1: every registered failure and unknown category, including zeros.

Cell	C	I	M	A	T	P	R	U
E0K0	0	8	0	0	0	0	0	0
E0K1	5	3	0	0	0	0	0	0
E0K2	0	8	0	0	0	0	0	0
E1K0	7	1	0	0	0	0	0	0
E1K1	7	1	0	0	0	0	0	0
E1K2	1	7	0	0	0	0	0	0
E2K0	7	0	1	0	0	0	0	0
E2K1	6	2	0	0	0	0	0	0
E2K2	5	2	1	0	0	0	0	0

Recorded resources

Table 71: Study J, csv export, orientation 1: recorded totals with unknown and planned opportunities retained; not comparative efficiency estimands.

Cell	Resource	Recorded total	U	N
E0K0	Time (s)	954.445672	0	8
E0K0	Trajectory (B)	244073	0	8
E0K0	Artifact (B)	17240	0	8
E0K1	Time (s)	1284.524905	0	8
E0K1	Trajectory (B)	276153	0	8
E0K1	Artifact (B)	17368	0	8
E0K2	Time (s)	1136.985810	0	8
E0K2	Trajectory (B)	255909	0	8
E0K2	Artifact (B)	17235	0	8
E1K0	Time (s)	1090.825918	0	8
E1K0	Trajectory (B)	309486	0	8
E1K0	Artifact (B)	17297	0	8
E1K1	Time (s)	881.691600	0	8
E1K1	Trajectory (B)	253273	0	8
E1K1	Artifact (B)	17311	0	8

Continued on next page

Table 71 (continued): Study J, csv export, orientation 1: recorded totals with unknown and planned opportunities retained; not comparative efficiency estimands.

Cell	Resource	Recorded total	U	N
E1K2	Time (s)	1242.303396	0	8
E1K2	Trajectory (B)	274755	0	8
E1K2	Artifact (B)	17335	0	8
E2K0	Time (s)	1155.195898	0	8
E2K0	Trajectory (B)	299499	0	8
E2K0	Artifact (B)	17298	0	8
E2K1	Time (s)	1180.720918	0	8
E2K1	Trajectory (B)	302329	0	8
E2K1	Artifact (B)	17308	0	8
E2K2	Time (s)	1093.662384	0	8
E2K2	Trajectory (B)	291517	0	8
E2K2	Artifact (B)	17310	0	8

All descriptive contrasts

Table 72: Study J, csv export, orientation 1: all descriptive contrasts in fixed order; lower/upper are arithmetic missingness bounds, not confidence intervals.

Contrast	Point	Lower	Upper	U comp.
E0: K1 - K0	0.625000	0.625000	0.625000	0
E0: K2 - K0	0.000000	0.000000	0.000000	0
E0: K1 - K2	0.625000	0.625000	0.625000	0
E1: K1 - K0	0.000000	0.000000	0.000000	0
E1: K2 - K0	-0.750000	-0.750000	-0.750000	0
E1: K1 - K2	0.750000	0.750000	0.750000	0
E2: K1 - K0	-0.125000	-0.125000	-0.125000	0
E2: K2 - K0	-0.250000	-0.250000	-0.250000	0
E2: K1 - K2	0.125000	0.125000	0.125000	0
K0: E1 - E0	0.875000	0.875000	0.875000	0
K0: E2 - E0	0.875000	0.875000	0.875000	0
K0: E2 - E1	0.000000	0.000000	0.000000	0
K1: E1 - E0	0.250000	0.250000	0.250000	0
K1: E2 - E0	0.125000	0.125000	0.125000	0
K1: E2 - E1	-0.125000	-0.125000	-0.125000	0
K2: E1 - E0	0.125000	0.125000	0.125000	0
K2: E2 - E0	0.625000	0.625000	0.625000	0
K2: E2 - E1	0.500000	0.500000	0.500000	0
(E0 - E1): (K1 - K0)	0.625000	0.625000	0.625000	0
(E0 - E1): (K2 - K0)	0.750000	0.750000	0.750000	0
(E0 - E1): (K1 - K2)	-0.125000	-0.125000	-0.125000	0
(E0 - E2): (K1 - K0)	0.750000	0.750000	0.750000	0
(E0 - E2): (K2 - K0)	0.250000	0.250000	0.250000	0
(E0 - E2): (K1 - K2)	0.500000	0.500000	0.500000	0
(E1 - E2): (K1 - K0)	0.125000	0.125000	0.125000	0
(E1 - E2): (K2 - K0)	-0.500000	-0.500000	-0.500000	0
(E1 - E2): (K1 - K2)	0.625000	0.625000	0.625000	0

I.13 Invoice ledger, orientation 0

Complete execution

Table 73: Study J, invoice ledger, orientation 0: complete successes and arithmetic missingness bounds.

Cell	S	U	N	Point	Lower	Upper
E0K0	5	0	8	0.625000	0.625000	0.625000
E0K1	8	0	8	1.000000	1.000000	1.000000
E0K2	0	0	8	0.000000	0.000000	0.000000
E1K0	8	0	8	1.000000	1.000000	1.000000
E1K1	8	0	8	1.000000	1.000000	1.000000
E1K2	0	0	8	0.000000	0.000000	0.000000
E2K0	8	0	8	1.000000	1.000000	1.000000
E2K1	6	0	8	0.750000	0.750000	0.750000
E2K2	5	0	8	0.625000	0.625000	0.625000

Dependent target positions

Table 74: Study J, invoice ledger, orientation 0: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E0K0	1	6	0	8	0.750000	0.750000	0.750000
E0K0	2	6	0	8	0.750000	0.750000	0.750000
E0K0	3	6	0	8	0.750000	0.750000	0.750000
E0K0	4	5	0	8	0.625000	0.625000	0.625000
E0K1	1	8	0	8	1.000000	1.000000	1.000000
E0K1	2	8	0	8	1.000000	1.000000	1.000000
E0K1	3	8	0	8	1.000000	1.000000	1.000000
E0K1	4	8	0	8	1.000000	1.000000	1.000000
E0K2	1	0	0	8	0.000000	0.000000	0.000000
E0K2	2	0	0	8	0.000000	0.000000	0.000000
E0K2	3	0	0	8	0.000000	0.000000	0.000000
E0K2	4	0	0	8	0.000000	0.000000	0.000000
E1K0	1	8	0	8	1.000000	1.000000	1.000000
E1K0	2	8	0	8	1.000000	1.000000	1.000000
E1K0	3	8	0	8	1.000000	1.000000	1.000000
E1K0	4	8	0	8	1.000000	1.000000	1.000000
E1K1	1	8	0	8	1.000000	1.000000	1.000000
E1K1	2	8	0	8	1.000000	1.000000	1.000000
E1K1	3	8	0	8	1.000000	1.000000	1.000000
E1K1	4	8	0	8	1.000000	1.000000	1.000000
E1K2	1	0	0	8	0.000000	0.000000	0.000000
E1K2	2	0	0	8	0.000000	0.000000	0.000000
E1K2	3	0	0	8	0.000000	0.000000	0.000000
E1K2	4	0	0	8	0.000000	0.000000	0.000000

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Table 74 (continued): Study J, invoice ledger, orientation 0: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E2K0	1	8	0	8	1.000000	1.000000	1.000000
E2K0	2	8	0	8	1.000000	1.000000	1.000000
E2K0	3	8	0	8	1.000000	1.000000	1.000000
E2K0	4	8	0	8	1.000000	1.000000	1.000000
E2K1	1	8	0	8	1.000000	1.000000	1.000000
E2K1	2	8	0	8	1.000000	1.000000	1.000000
E2K1	3	6	0	8	0.750000	0.750000	0.750000
E2K1	4	8	0	8	1.000000	1.000000	1.000000
E2K2	1	5	0	8	0.625000	0.625000	0.625000
E2K2	2	5	0	8	0.625000	0.625000	0.625000
E2K2	3	5	0	8	0.625000	0.625000	0.625000
E2K2	4	5	0	8	0.625000	0.625000	0.625000

Failure and unknown categories

Table 75: Study J, invoice ledger, orientation 0: every registered failure and unknown category, including zeros.

Cell	C	I	M	A	T	P	R	U
E0K0	5	3	0	0	0	0	0	0
E0K1	8	0	0	0	0	0	0	0
E0K2	0	8	0	0	0	0	0	0
E1K0	8	0	0	0	0	0	0	0
E1K1	8	0	0	0	0	0	0	0
E1K2	0	8	0	0	0	0	0	0
E2K0	8	0	0	0	0	0	0	0
E2K1	6	2	0	0	0	0	0	0
E2K2	5	3	0	0	0	0	0	0

Recorded resources

Table 76: Study J, invoice ledger, orientation 0: recorded totals with unknown and planned opportunities retained; not comparative efficiency estimands.

Cell	Resource	Recorded total	U	N
E0K0	Time (s)	566.696045	0	8
E0K0	Trajectory (B)	161368	0	8
E0K0	Artifact (B)	7242	0	8
E0K1	Time (s)	446.239347	0	8
E0K1	Trajectory (B)	144276	0	8
E0K1	Artifact (B)	7242	0	8
E0K2	Time (s)	505.100285	0	8
E0K2	Trajectory (B)	154234	0	8
E0K2	Artifact (B)	7240	0	8

Continued on next page

Table 76 (continued): Study J, invoice ledger, orientation 0: recorded totals with unknown and planned opportunities retained; not comparative efficiency estimands.

Cell	Resource	Recorded total	U	N
E1K0	Time (s)	560.618945	0	8
E1K0	Trajectory (B)	142059	0	8
E1K0	Artifact (B)	7242	0	8
E1K1	Time (s)	466.846708	0	8
E1K1	Trajectory (B)	139780	0	8
E1K1	Artifact (B)	7242	0	8
E1K2	Time (s)	426.741259	0	8
E1K2	Trajectory (B)	138679	0	8
E1K2	Artifact (B)	7242	0	8
E2K0	Time (s)	438.935341	0	8
E2K0	Trajectory (B)	135021	0	8
E2K0	Artifact (B)	7242	0	8
E2K1	Time (s)	481.652828	0	8
E2K1	Trajectory (B)	142655	0	8
E2K1	Artifact (B)	7242	0	8
E2K2	Time (s)	498.867911	0	8
E2K2	Trajectory (B)	156777	0	8
E2K2	Artifact (B)	7242	0	8

ALL DESCRIPTIVE CONTRASTS

Table 77: Study J, invoice ledger, orientation 0: all descriptive contrasts in fixed order; lower/upper are arithmetic missingness bounds, not confidence intervals.

Contrast	Point	Lower	Upper	U comp.
E0: K1 - K0	0.375000	0.375000	0.375000	0
E0: K2 - K0	-0.625000	-0.625000	-0.625000	0
E0: K1 - K2	1.000000	1.000000	1.000000	0
E1: K1 - K0	0.000000	0.000000	0.000000	0
E1: K2 - K0	-1.000000	-1.000000	-1.000000	0
E1: K1 - K2	1.000000	1.000000	1.000000	0
E2: K1 - K0	-0.250000	-0.250000	-0.250000	0
E2: K2 - K0	-0.375000	-0.375000	-0.375000	0
E2: K1 - K2	0.125000	0.125000	0.125000	0
K0: E1 - E0	0.375000	0.375000	0.375000	0
K0: E2 - E0	0.375000	0.375000	0.375000	0
K0: E2 - E1	0.000000	0.000000	0.000000	0
K1: E1 - E0	0.000000	0.000000	0.000000	0
K1: E2 - E0	-0.250000	-0.250000	-0.250000	0
K1: E2 - E1	-0.250000	-0.250000	-0.250000	0
K2: E1 - E0	0.000000	0.000000	0.000000	0
K2: E2 - E0	0.625000	0.625000	0.625000	0
K2: E2 - E1	0.625000	0.625000	0.625000	0
(E0 - E1): (K1 - K0)	0.375000	0.375000	0.375000	0
(E0 - E1): (K2 - K0)	0.375000	0.375000	0.375000	0
(E0 - E1): (K1 - K2)	0.000000	0.000000	0.000000	0

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Table 77 (continued): Study J, invoice ledger, orientation 0: all descriptive contrasts in fixed order; lower/upper are arithmetic missingness bounds, not confidence intervals.

Contrast	Point	Lower	Upper	U comp.
(E0 - E2): (K1 - K0)	0.625000	0.625000	0.625000	0
(E0 - E2): (K2 - K0)	-0.250000	-0.250000	-0.250000	0
(E0 - E2): (K1 - K2)	0.875000	0.875000	0.875000	0
(E1 - E2): (K1 - K0)	0.250000	0.250000	0.250000	0
(E1 - E2): (K2 - K0)	-0.625000	-0.625000	-0.625000	0
(E1 - E2): (K1 - K2)	0.875000	0.875000	0.875000	0

I.14 Invoice ledger, orientation 1

Complete execution

Table 78: Study J, invoice ledger, orientation 1: complete successes and arithmetic missingness bounds.

Cell	S	U	N	Point	Lower	Upper
E0K0	1	0	8	0.125000	0.125000	0.125000
E0K1	5	0	8	0.625000	0.625000	0.625000
E0K2	0	0	8	0.000000	0.000000	0.000000
E1K0	7	0	8	0.875000	0.875000	0.875000
E1K1	7	0	8	0.875000	0.875000	0.875000
E1K2	0	0	8	0.000000	0.000000	0.000000
E2K0	7	0	8	0.875000	0.875000	0.875000
E2K1	7	0	8	0.875000	0.875000	0.875000
E2K2	5	0	8	0.625000	0.625000	0.625000

Dependent target positions

Table 79: Study J, invoice ledger, orientation 1: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E0K0	1	1	0	8	0.125000	0.125000	0.125000
E0K0	2	1	0	8	0.125000	0.125000	0.125000
E0K0	3	1	0	8	0.125000	0.125000	0.125000
E0K0	4	1	0	8	0.125000	0.125000	0.125000
E0K1	1	7	0	8	0.875000	0.875000	0.875000
E0K1	2	6	0	8	0.750000	0.750000	0.750000
E0K1	3	6	0	8	0.750000	0.750000	0.750000
E0K1	4	7	0	8	0.875000	0.875000	0.875000
E0K2	1	0	0	8	0.000000	0.000000	0.000000
E0K2	2	0	0	8	0.000000	0.000000	0.000000
E0K2	3	0	0	8	0.000000	0.000000	0.000000
E0K2	4	0	0	8	0.000000	0.000000	0.000000
E1K0	1	7	0	8	0.875000	0.875000	0.875000
E1K0	2	7	0	8	0.875000	0.875000	0.875000
E1K0	3	7	0	8	0.875000	0.875000	0.875000
E1K0	4	7	0	8	0.875000	0.875000	0.875000

Continued on next page

Table 79 (continued): Study J, invoice ledger, orientation 1: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E1K1	1	7	0	8	0.875000	0.875000	0.875000
E1K1	2	7	0	8	0.875000	0.875000	0.875000
E1K1	3	7	0	8	0.875000	0.875000	0.875000
E1K1	4	7	0	8	0.875000	0.875000	0.875000
E1K2	1	0	0	8	0.000000	0.000000	0.000000
E1K2	2	0	0	8	0.000000	0.000000	0.000000
E1K2	3	0	0	8	0.000000	0.000000	0.000000
E1K2	4	0	0	8	0.000000	0.000000	0.000000
E2K0	1	7	0	8	0.875000	0.875000	0.875000
E2K0	2	7	0	8	0.875000	0.875000	0.875000
E2K0	3	7	0	8	0.875000	0.875000	0.875000
E2K0	4	7	0	8	0.875000	0.875000	0.875000
E2K1	1	7	0	8	0.875000	0.875000	0.875000
E2K1	2	7	0	8	0.875000	0.875000	0.875000
E2K1	3	7	0	8	0.875000	0.875000	0.875000
E2K1	4	7	0	8	0.875000	0.875000	0.875000
E2K2	1	5	0	8	0.625000	0.625000	0.625000
E2K2	2	5	0	8	0.625000	0.625000	0.625000
E2K2	3	5	0	8	0.625000	0.625000	0.625000
E2K2	4	5	0	8	0.625000	0.625000	0.625000

Failure and unknown categories

Table 80: Study J, invoice ledger, orientation 1: every registered failure and unknown category, including zeros.

Cell	C	I	M	A	T	P	R	U
E0K0	1	6	0	0	0	1	0	0
E0K1	5	2	0	0	0	1	0	0
E0K2	0	7	0	0	0	1	0	0
E1K0	7	0	0	0	0	1	0	0
E1K1	7	0	0	0	0	1	0	0
E1K2	0	7	0	0	0	1	0	0
E2K0	7	0	0	0	0	1	0	0
E2K1	7	0	0	0	0	1	0	0
E2K2	5	2	0	0	0	1	0	0

Recorded resources

Table 81: Study J, invoice ledger, orientation 1: recorded totals with unknown and planned opportunities retained; not comparative efficiency estimands.

Cell	Resource	Recorded total	U	N
E0K0	Time (s)	655.634145	0	8
E0K0	Trajectory (B)	150650	0	8
E0K0	Artifact (B)	6340	0	8
E0K1	Time (s)	642.800221	0	8
E0K1	Trajectory (B)	149418	0	8
E0K1	Artifact (B)	6340	0	8
E0K2	Time (s)	617.098958	0	8
E0K2	Trajectory (B)	132825	0	8
E0K2	Artifact (B)	6339	0	8
E1K0	Time (s)	591.524738	0	8
E1K0	Trajectory (B)	147602	0	8
E1K0	Artifact (B)	6339	0	8
E1K1	Time (s)	596.863815	0	8
E1K1	Trajectory (B)	139659	0	8
E1K1	Artifact (B)	6339	0	8
E1K2	Time (s)	1040.227251	0	8
E1K2	Trajectory (B)	149676	0	8
E1K2	Artifact (B)	6339	0	8
E2K0	Time (s)	649.212874	0	8
E2K0	Trajectory (B)	154676	0	8
E2K0	Artifact (B)	6339	0	8
E2K1	Time (s)	682.218818	0	8
E2K1	Trajectory (B)	148707	0	8
E2K1	Artifact (B)	6339	0	8
E2K2	Time (s)	605.537335	0	8
E2K2	Trajectory (B)	147013	0	8
E2K2	Artifact (B)	6339	0	8

All descriptive contrasts

Table 82: Study J, invoice ledger, orientation 1: all descriptive contrasts in fixed order; lower/upper are arithmetic missingness bounds, not confidence intervals.

Contrast	Point	Lower	Upper	U comp.
E0: K1 - K0	0.500000	0.500000	0.500000	0
E0: K2 - K0	-0.125000	-0.125000	-0.125000	0
E0: K1 - K2	0.625000	0.625000	0.625000	0
E1: K1 - K0	0.000000	0.000000	0.000000	0
E1: K2 - K0	-0.875000	-0.875000	-0.875000	0
E1: K1 - K2	0.875000	0.875000	0.875000	0
E2: K1 - K0	0.000000	0.000000	0.000000	0
E2: K2 - K0	-0.250000	-0.250000	-0.250000	0
E2: K1 - K2	0.250000	0.250000	0.250000	0
K0: E1 - E0	0.750000	0.750000	0.750000	0

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Table 82 (continued): Study J, invoice ledger, orientation 1: all descriptive contrasts in fixed order; lower/upper are arithmetic missingness bounds, not confidence intervals.

Contrast	Point	Lower	Upper	U comp.
K0: E2 - E0	0.750000	0.750000	0.750000	0
K0: E2 - E1	0.000000	0.000000	0.000000	0
K1: E1 - E0	0.250000	0.250000	0.250000	0
K1: E2 - E0	0.250000	0.250000	0.250000	0
K1: E2 - E1	0.000000	0.000000	0.000000	0
K2: E1 - E0	0.000000	0.000000	0.000000	0
K2: E2 - E0	0.625000	0.625000	0.625000	0
K2: E2 - E1	0.625000	0.625000	0.625000	0
(E0 - E1): (K1 - K0)	0.500000	0.500000	0.500000	0
(E0 - E1): (K2 - K0)	0.750000	0.750000	0.750000	0
(E0 - E1): (K1 - K2)	-0.250000	-0.250000	-0.250000	0
(E0 - E2): (K1 - K0)	0.500000	0.500000	0.500000	0
(E0 - E2): (K2 - K0)	0.125000	0.125000	0.125000	0
(E0 - E2): (K1 - K2)	0.375000	0.375000	0.375000	0
(E1 - E2): (K1 - K0)	0.000000	0.000000	0.000000	0
(E1 - E2): (K2 - K0)	-0.625000	-0.625000	-0.625000	0
(E1 - E2): (K1 - K2)	0.625000	0.625000	0.625000	0

I.15 URL QUERY EXPORT, ORIENTATION 0

COMPLETE EXECUTION

Table 83: Study J, url query export, orientation 0: complete successes and arithmetic missingness bounds.

Cell	S	U	N	Point	Lower	Upper
E0K0	0	0	8	0.000000	0.000000	0.000000
E0K1	0	0	8	0.000000	0.000000	0.000000
E0K2	0	0	8	0.000000	0.000000	0.000000
E1K0	0	0	8	0.000000	0.000000	0.000000
E1K1	0	0	8	0.000000	0.000000	0.000000
E1K2	0	0	8	0.000000	0.000000	0.000000
E2K0	0	0	8	0.000000	0.000000	0.000000
E2K1	0	0	8	0.000000	0.000000	0.000000
E2K2	0	0	8	0.000000	0.000000	0.000000

DEPENDENT TARGET POSITIONS

Table 84: Study J, url query export, orientation 0: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E0K0	1	0	0	8	0.000000	0.000000	0.000000
E0K0	2	0	0	8	0.000000	0.000000	0.000000
E0K0	3	0	0	8	0.000000	0.000000	0.000000
E0K0	4	0	0	8	0.000000	0.000000	0.000000

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Table 84 (continued): Study J, url query export, orientation 0: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E0K1	1	0	0	8	0.000000	0.000000	0.000000
E0K1	2	0	0	8	0.000000	0.000000	0.000000
E0K1	3	0	0	8	0.000000	0.000000	0.000000
E0K1	4	0	0	8	0.000000	0.000000	0.000000
E0K2	1	0	0	8	0.000000	0.000000	0.000000
E0K2	2	0	0	8	0.000000	0.000000	0.000000
E0K2	3	0	0	8	0.000000	0.000000	0.000000
E0K2	4	0	0	8	0.000000	0.000000	0.000000
E1K0	1	0	0	8	0.000000	0.000000	0.000000
E1K0	2	0	0	8	0.000000	0.000000	0.000000
E1K0	3	0	0	8	0.000000	0.000000	0.000000
E1K0	4	0	0	8	0.000000	0.000000	0.000000
E1K1	1	0	0	8	0.000000	0.000000	0.000000
E1K1	2	0	0	8	0.000000	0.000000	0.000000
E1K1	3	0	0	8	0.000000	0.000000	0.000000
E1K1	4	0	0	8	0.000000	0.000000	0.000000
E1K2	1	0	0	8	0.000000	0.000000	0.000000
E1K2	2	0	0	8	0.000000	0.000000	0.000000
E1K2	3	0	0	8	0.000000	0.000000	0.000000
E1K2	4	0	0	8	0.000000	0.000000	0.000000
E2K0	1	0	0	8	0.000000	0.000000	0.000000
E2K0	2	0	0	8	0.000000	0.000000	0.000000
E2K0	3	0	0	8	0.000000	0.000000	0.000000
E2K0	4	0	0	8	0.000000	0.000000	0.000000
E2K1	1	0	0	8	0.000000	0.000000	0.000000
E2K1	2	0	0	8	0.000000	0.000000	0.000000
E2K1	3	0	0	8	0.000000	0.000000	0.000000
E2K1	4	0	0	8	0.000000	0.000000	0.000000
E2K2	1	0	0	8	0.000000	0.000000	0.000000
E2K2	2	0	0	8	0.000000	0.000000	0.000000
E2K2	3	0	0	8	0.000000	0.000000	0.000000
E2K2	4	0	0	8	0.000000	0.000000	0.000000

Failure and unknown categories

Table 85: Study J, url query export, orientation 0: every registered failure and unknown category, including zeros.

Cell	C	I	M	A	T	P	R	U
E0K0	0	0	0	0	0	8	0	0
E0K1	0	0	0	0	0	8	0	0
E0K2	0	0	0	0	0	8	0	0
E1K0	0	0	0	0	0	8	0	0
E1K1	0	0	0	0	0	8	0	0
E1K2	0	0	0	0	0	8	0	0
E2K0	0	0	0	0	0	8	0	0
E2K1	0	0	0	0	0	8	0	0
E2K2	0	0	0	0	0	8	0	0

Recorded resources

Table 86: Study J, url query export, orientation 0: recorded totals with unknown and planned opportunities retained; not comparative efficiency estimands.

Cell	Resource	Recorded total	U	N
E0K0	Time (s)	91.475144	0	8
E0K0	Trajectory (B)	3672	0	8
E0K0	Artifact (B)	0	0	8
E0K1	Time (s)	91.353551	0	8
E0K1	Trajectory (B)	3672	0	8
E0K1	Artifact (B)	0	0	8
E0K2	Time (s)	93.590920	0	8
E0K2	Trajectory (B)	3672	0	8
E0K2	Artifact (B)	0	0	8
E1K0	Time (s)	93.846437	0	8
E1K0	Trajectory (B)	3672	0	8
E1K0	Artifact (B)	0	0	8
E1K1	Time (s)	92.140259	0	8
E1K1	Trajectory (B)	3672	0	8
E1K1	Artifact (B)	0	0	8
E1K2	Time (s)	93.728098	0	8
E1K2	Trajectory (B)	3672	0	8
E1K2	Artifact (B)	0	0	8
E2K0	Time (s)	91.361538	0	8
E2K0	Trajectory (B)	3672	0	8
E2K0	Artifact (B)	0	0	8
E2K1	Time (s)	95.488063	0	8
E2K1	Trajectory (B)	3672	0	8
E2K1	Artifact (B)	0	0	8
E2K2	Time (s)	93.046540	0	8
E2K2	Trajectory (B)	3672	0	8
E2K2	Artifact (B)	0	0	8

All descriptive contrasts

Table 87: Study J, url query export, orientation 0: all descriptive contrasts in fixed order; lower/upper are arithmetic missingness bounds, not confidence intervals.

Contrast	Point	Lower	Upper	U comp.
E0: K1 - K0	0.000000	0.000000	0.000000	0
E0: K2 - K0	0.000000	0.000000	0.000000	0
E0: K1 - K2	0.000000	0.000000	0.000000	0
E1: K1 - K0	0.000000	0.000000	0.000000	0
E1: K2 - K0	0.000000	0.000000	0.000000	0
E1: K1 - K2	0.000000	0.000000	0.000000	0
E2: K1 - K0	0.000000	0.000000	0.000000	0
E2: K2 - K0	0.000000	0.000000	0.000000	0
E2: K1 - K2	0.000000	0.000000	0.000000	0
K0: E1 - E0	0.000000	0.000000	0.000000	0

Continued on next page

Table 87 (continued): Study J, url query export, orientation 0: all descriptive contrasts in fixed order; lower/upper are arithmetic missingness bounds, not confidence intervals.

Contrast	Point	Lower	Upper	U comp.
K0: E2 - E0	0.000000	0.000000	0.000000	0
K0: E2 - E1	0.000000	0.000000	0.000000	0
K1: E1 - E0	0.000000	0.000000	0.000000	0
K1: E2 - E0	0.000000	0.000000	0.000000	0
K1: E2 - E1	0.000000	0.000000	0.000000	0
K2: E1 - E0	0.000000	0.000000	0.000000	0
K2: E2 - E0	0.000000	0.000000	0.000000	0
K2: E2 - E1	0.000000	0.000000	0.000000	0
(E0 - E1): (K1 - K0)	0.000000	0.000000	0.000000	0
(E0 - E1): (K2 - K0)	0.000000	0.000000	0.000000	0
(E0 - E1): (K1 - K2)	0.000000	0.000000	0.000000	0
(E0 - E2): (K1 - K0)	0.000000	0.000000	0.000000	0
(E0 - E2): (K2 - K0)	0.000000	0.000000	0.000000	0
(E0 - E2): (K1 - K2)	0.000000	0.000000	0.000000	0
(E1 - E2): (K1 - K0)	0.000000	0.000000	0.000000	0
(E1 - E2): (K2 - K0)	0.000000	0.000000	0.000000	0
(E1 - E2): (K1 - K2)	0.000000	0.000000	0.000000	0

I.16 URL QUERY EXPORT, ORIENTATION 1

COMPLETE EXECUTION

Table 88: Study J, url query export, orientation 1: complete successes and arithmetic missingness bounds.

Cell	S	U	N	Point	Lower	Upper
E0K0	0	0	8	0.000000	0.000000	0.000000
E0K1	0	0	8	0.000000	0.000000	0.000000
E0K2	0	0	8	0.000000	0.000000	0.000000
E1K0	0	0	8	0.000000	0.000000	0.000000
E1K1	0	0	8	0.000000	0.000000	0.000000
E1K2	0	0	8	0.000000	0.000000	0.000000
E2K0	0	0	8	0.000000	0.000000	0.000000
E2K1	0	0	8	0.000000	0.000000	0.000000
E2K2	0	0	8	0.000000	0.000000	0.000000

DEPENDENT TARGET POSITIONS

Table 89: Study J, url query export, orientation 1: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E0K0	1	0	0	8	0.000000	0.000000	0.000000
E0K0	2	0	0	8	0.000000	0.000000	0.000000
E0K0	3	0	0	8	0.000000	0.000000	0.000000
E0K0	4	0	0	8	0.000000	0.000000	0.000000

Continued on next page

Table 89 (continued): Study J, url query export, orientation 1: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E0K1	1	0	0	8	0.000000	0.000000	0.000000
E0K1	2	0	0	8	0.000000	0.000000	0.000000
E0K1	3	0	0	8	0.000000	0.000000	0.000000
E0K1	4	0	0	8	0.000000	0.000000	0.000000
E0K2	1	0	0	8	0.000000	0.000000	0.000000
E0K2	2	0	0	8	0.000000	0.000000	0.000000
E0K2	3	0	0	8	0.000000	0.000000	0.000000
E0K2	4	0	0	8	0.000000	0.000000	0.000000
E1K0	1	0	0	8	0.000000	0.000000	0.000000
E1K0	2	0	0	8	0.000000	0.000000	0.000000
E1K0	3	0	0	8	0.000000	0.000000	0.000000
E1K0	4	0	0	8	0.000000	0.000000	0.000000
E1K1	1	0	0	8	0.000000	0.000000	0.000000
E1K1	2	0	0	8	0.000000	0.000000	0.000000
E1K1	3	0	0	8	0.000000	0.000000	0.000000
E1K1	4	0	0	8	0.000000	0.000000	0.000000
E1K2	1	0	0	8	0.000000	0.000000	0.000000
E1K2	2	0	0	8	0.000000	0.000000	0.000000
E1K2	3	0	0	8	0.000000	0.000000	0.000000
E1K2	4	0	0	8	0.000000	0.000000	0.000000
E2K0	1	0	0	8	0.000000	0.000000	0.000000
E2K0	2	0	0	8	0.000000	0.000000	0.000000
E2K0	3	0	0	8	0.000000	0.000000	0.000000
E2K0	4	0	0	8	0.000000	0.000000	0.000000
E2K1	1	0	0	8	0.000000	0.000000	0.000000
E2K1	2	0	0	8	0.000000	0.000000	0.000000
E2K1	3	0	0	8	0.000000	0.000000	0.000000
E2K1	4	0	0	8	0.000000	0.000000	0.000000
E2K2	1	0	0	8	0.000000	0.000000	0.000000
E2K2	2	0	0	8	0.000000	0.000000	0.000000
E2K2	3	0	0	8	0.000000	0.000000	0.000000
E2K2	4	0	0	8	0.000000	0.000000	0.000000

Failure and unknown categories

Table 90: Study J, url query export, orientation 1: every registered failure and unknown category, including zeros.

Cell	C	I	M	A	T	P	R	U
E0K0	0	0	0	0	0	8	0	0
E0K1	0	0	0	0	0	8	0	0
E0K2	0	0	0	0	0	8	0	0
E1K0	0	0	0	0	0	8	0	0
E1K1	0	0	0	0	0	8	0	0
E1K2	0	0	0	0	0	8	0	0
E2K0	0	0	0	0	0	8	0	0
E2K1	0	0	0	0	0	8	0	0
E2K2	0	0	0	0	0	8	0	0

Recorded resources

Table 91: Study J, url query export, orientation 1: recorded totals with unknown and planned opportunities retained; not comparative efficiency estimands.

Cell	Resource	Recorded total	U	N
E0K0	Time (s)	100.684329	0	8
E0K0	Trajectory (B)	3672	0	8
E0K0	Artifact (B)	0	0	8
E0K1	Time (s)	100.427443	0	8
E0K1	Trajectory (B)	3672	0	8
E0K1	Artifact (B)	0	0	8
E0K2	Time (s)	102.164633	0	8
E0K2	Trajectory (B)	3672	0	8
E0K2	Artifact (B)	0	0	8
E1K0	Time (s)	99.413719	0	8
E1K0	Trajectory (B)	3672	0	8
E1K0	Artifact (B)	0	0	8
E1K1	Time (s)	99.038914	0	8
E1K1	Trajectory (B)	3672	0	8
E1K1	Artifact (B)	0	0	8
E1K2	Time (s)	100.955354	0	8
E1K2	Trajectory (B)	3672	0	8
E1K2	Artifact (B)	0	0	8
E2K0	Time (s)	100.806161	0	8
E2K0	Trajectory (B)	3672	0	8
E2K0	Artifact (B)	0	0	8
E2K1	Time (s)	100.959450	0	8
E2K1	Trajectory (B)	3672	0	8
E2K1	Artifact (B)	0	0	8
E2K2	Time (s)	101.975529	0	8
E2K2	Trajectory (B)	3672	0	8
E2K2	Artifact (B)	0	0	8

All descriptive contrasts

Table 92: Study J, url query export, orientation 1: all descriptive contrasts in fixed order; lower/upper are arithmetic missingness bounds, not confidence intervals.

Contrast	Point	Lower	Upper	U comp.
E0: K1 - K0	0.000000	0.000000	0.000000	0
E0: K2 - K0	0.000000	0.000000	0.000000	0
E0: K1 - K2	0.000000	0.000000	0.000000	0
E1: K1 - K0	0.000000	0.000000	0.000000	0
E1: K2 - K0	0.000000	0.000000	0.000000	0
E1: K1 - K2	0.000000	0.000000	0.000000	0
E2: K1 - K0	0.000000	0.000000	0.000000	0
E2: K2 - K0	0.000000	0.000000	0.000000	0
E2: K1 - K2	0.000000	0.000000	0.000000	0
K0: E1 - E0	0.000000	0.000000	0.000000	0

Continued on next page

Table 92 (continued): Study J, url query export, orientation 1: all descriptive contrasts in fixed order; lower/upper are arithmetic missingness bounds, not confidence intervals.

Contrast	Point	Lower	Upper	U comp.
K0: E2 - E0	0.000000	0.000000	0.000000	0
K0: E2 - E1	0.000000	0.000000	0.000000	0
K1: E1 - E0	0.000000	0.000000	0.000000	0
K1: E2 - E0	0.000000	0.000000	0.000000	0
K1: E2 - E1	0.000000	0.000000	0.000000	0
K2: E1 - E0	0.000000	0.000000	0.000000	0
K2: E2 - E0	0.000000	0.000000	0.000000	0
K2: E2 - E1	0.000000	0.000000	0.000000	0
(E0 - E1): (K1 - K0)	0.000000	0.000000	0.000000	0
(E0 - E1): (K2 - K0)	0.000000	0.000000	0.000000	0
(E0 - E1): (K1 - K2)	0.000000	0.000000	0.000000	0
(E0 - E2): (K1 - K0)	0.000000	0.000000	0.000000	0
(E0 - E2): (K2 - K0)	0.000000	0.000000	0.000000	0
(E0 - E2): (K1 - K2)	0.000000	0.000000	0.000000	0
(E1 - E2): (K1 - K0)	0.000000	0.000000	0.000000	0
(E1 - E2): (K2 - K0)	0.000000	0.000000	0.000000	0
(E1 - E2): (K1 - K2)	0.000000	0.000000	0.000000	0

I.17 Unicode index, orientation 0

Complete execution

Table 93: Study J, unicode index, orientation 0: complete successes and arithmetic missingness bounds.

Cell	S	U	N	Point	Lower	Upper
E0K0	0	0	8	0.000000	0.000000	0.000000
E0K1	0	0	8	0.000000	0.000000	0.000000
E0K2	0	0	8	0.000000	0.000000	0.000000
E1K0	0	0	8	0.000000	0.000000	0.000000
E1K1	0	0	8	0.000000	0.000000	0.000000
E1K2	0	0	8	0.000000	0.000000	0.000000
E2K0	0	0	8	0.000000	0.000000	0.000000
E2K1	0	0	8	0.000000	0.000000	0.000000
E2K2	0	0	8	0.000000	0.000000	0.000000

Dependent target positions

Table 94: Study J, unicode index, orientation 0: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E0K0	1	0	0	8	0.000000	0.000000	0.000000
E0K0	2	0	0	8	0.000000	0.000000	0.000000
E0K0	3	0	0	8	0.000000	0.000000	0.000000
E0K0	4	0	0	8	0.000000	0.000000	0.000000

Continued on next page

Table 94 (continued): Study J, unicode index, orientation 0: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E0K1	1	0	0	8	0.000000	0.000000	0.000000
E0K1	2	0	0	8	0.000000	0.000000	0.000000
E0K1	3	0	0	8	0.000000	0.000000	0.000000
E0K1	4	0	0	8	0.000000	0.000000	0.000000
E0K2	1	0	0	8	0.000000	0.000000	0.000000
E0K2	2	0	0	8	0.000000	0.000000	0.000000
E0K2	3	0	0	8	0.000000	0.000000	0.000000
E0K2	4	0	0	8	0.000000	0.000000	0.000000
E1K0	1	0	0	8	0.000000	0.000000	0.000000
E1K0	2	0	0	8	0.000000	0.000000	0.000000
E1K0	3	0	0	8	0.000000	0.000000	0.000000
E1K0	4	0	0	8	0.000000	0.000000	0.000000
E1K1	1	0	0	8	0.000000	0.000000	0.000000
E1K1	2	0	0	8	0.000000	0.000000	0.000000
E1K1	3	0	0	8	0.000000	0.000000	0.000000
E1K1	4	0	0	8	0.000000	0.000000	0.000000
E1K2	1	0	0	8	0.000000	0.000000	0.000000
E1K2	2	0	0	8	0.000000	0.000000	0.000000
E1K2	3	0	0	8	0.000000	0.000000	0.000000
E1K2	4	0	0	8	0.000000	0.000000	0.000000
E2K0	1	0	0	8	0.000000	0.000000	0.000000
E2K0	2	0	0	8	0.000000	0.000000	0.000000
E2K0	3	0	0	8	0.000000	0.000000	0.000000
E2K0	4	0	0	8	0.000000	0.000000	0.000000
E2K1	1	0	0	8	0.000000	0.000000	0.000000
E2K1	2	0	0	8	0.000000	0.000000	0.000000
E2K1	3	0	0	8	0.000000	0.000000	0.000000
E2K1	4	0	0	8	0.000000	0.000000	0.000000
E2K2	1	0	0	8	0.000000	0.000000	0.000000
E2K2	2	0	0	8	0.000000	0.000000	0.000000
E2K2	3	0	0	8	0.000000	0.000000	0.000000
E2K2	4	0	0	8	0.000000	0.000000	0.000000

Failure and unknown categories

Table 95: Study J, unicode index, orientation 0: every registered failure and unknown category, including zeros.

Cell	C	I	M	A	T	P	R	U
E0K0	0	0	0	0	0	8	0	0
E0K1	0	0	0	0	0	8	0	0
E0K2	0	0	0	0	0	8	0	0
E1K0	0	0	0	0	0	8	0	0
E1K1	0	0	0	0	0	8	0	0
E1K2	0	0	0	0	0	8	0	0
E2K0	0	0	0	0	0	8	0	0
E2K1	0	0	0	0	0	8	0	0
E2K2	0	0	0	0	0	8	0	0

Recorded resources

Table 96: Study J, unicode index, orientation 0: recorded totals with unknown and planned opportunities retained; not comparative efficiency estimands.

Cell	Resource	Recorded total	U	N
E0K0	Time (s)	104.746814	0	8
E0K0	Trajectory (B)	3672	0	8
E0K0	Artifact (B)	0	0	8
E0K1	Time (s)	104.575632	0	8
E0K1	Trajectory (B)	3672	0	8
E0K1	Artifact (B)	0	0	8
E0K2	Time (s)	105.792149	0	8
E0K2	Trajectory (B)	3672	0	8
E0K2	Artifact (B)	0	0	8
E1K0	Time (s)	104.839692	0	8
E1K0	Trajectory (B)	3672	0	8
E1K0	Artifact (B)	0	0	8
E1K1	Time (s)	105.142670	0	8
E1K1	Trajectory (B)	3672	0	8
E1K1	Artifact (B)	0	0	8
E1K2	Time (s)	105.154911	0	8
E1K2	Trajectory (B)	3672	0	8
E1K2	Artifact (B)	0	0	8
E2K0	Time (s)	104.670113	0	8
E2K0	Trajectory (B)	3672	0	8
E2K0	Artifact (B)	0	0	8
E2K1	Time (s)	105.269563	0	8
E2K1	Trajectory (B)	3672	0	8
E2K1	Artifact (B)	0	0	8
E2K2	Time (s)	106.383765	0	8
E2K2	Trajectory (B)	3672	0	8
E2K2	Artifact (B)	0	0	8

All descriptive contrasts

Table 97: Study J, unicode index, orientation 0: all descriptive contrasts in fixed order; lower/upper are arithmetic missingness bounds, not confidence intervals.

Contrast	Point	Lower	Upper	U comp.
E0: K1 - K0	0.000000	0.000000	0.000000	0
E0: K2 - K0	0.000000	0.000000	0.000000	0
E0: K1 - K2	0.000000	0.000000	0.000000	0
E1: K1 - K0	0.000000	0.000000	0.000000	0
E1: K2 - K0	0.000000	0.000000	0.000000	0
E1: K1 - K2	0.000000	0.000000	0.000000	0
E2: K1 - K0	0.000000	0.000000	0.000000	0
E2: K2 - K0	0.000000	0.000000	0.000000	0
E2: K1 - K2	0.000000	0.000000	0.000000	0
K0: E1 - E0	0.000000	0.000000	0.000000	0

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Table 97 (continued): Study J, unicode index, orientation 0: all descriptive contrasts in fixed order; lower/upper are arithmetic missingness bounds, not confidence intervals.

Contrast	Point	Lower	Upper	U comp.
K0: E2 - E0	0.000000	0.000000	0.000000	0
K0: E2 - E1	0.000000	0.000000	0.000000	0
K1: E1 - E0	0.000000	0.000000	0.000000	0
K1: E2 - E0	0.000000	0.000000	0.000000	0
K1: E2 - E1	0.000000	0.000000	0.000000	0
K2: E1 - E0	0.000000	0.000000	0.000000	0
K2: E2 - E0	0.000000	0.000000	0.000000	0
K2: E2 - E1	0.000000	0.000000	0.000000	0
(E0 - E1): (K1 - K0)	0.000000	0.000000	0.000000	0
(E0 - E1): (K2 - K0)	0.000000	0.000000	0.000000	0
(E0 - E1): (K1 - K2)	0.000000	0.000000	0.000000	0
(E0 - E2): (K1 - K0)	0.000000	0.000000	0.000000	0
(E0 - E2): (K2 - K0)	0.000000	0.000000	0.000000	0
(E0 - E2): (K1 - K2)	0.000000	0.000000	0.000000	0
(E1 - E2): (K1 - K0)	0.000000	0.000000	0.000000	0
(E1 - E2): (K2 - K0)	0.000000	0.000000	0.000000	0
(E1 - E2): (K1 - K2)	0.000000	0.000000	0.000000	0

I.18 Unicode index, orientation 1

Complete execution

Table 98: Study J, unicode index, orientation 1: complete successes and arithmetic missingness bounds.

Cell	S	U	N	Point	Lower	Upper
E0K0	0	0	8	0.000000	0.000000	0.000000
E0K1	0	0	8	0.000000	0.000000	0.000000
E0K2	0	0	8	0.000000	0.000000	0.000000
E1K0	0	0	8	0.000000	0.000000	0.000000
E1K1	0	0	8	0.000000	0.000000	0.000000
E1K2	0	0	8	0.000000	0.000000	0.000000
E2K0	0	0	8	0.000000	0.000000	0.000000
E2K1	0	0	8	0.000000	0.000000	0.000000
E2K2	0	0	8	0.000000	0.000000	0.000000

Dependent target positions

Table 99: Study J, unicode index, orientation 1: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E0K0	1	0	0	8	0.000000	0.000000	0.000000
E0K0	2	0	0	8	0.000000	0.000000	0.000000
E0K0	3	0	0	8	0.000000	0.000000	0.000000
E0K0	4	0	0	8	0.000000	0.000000	0.000000

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Table 99 (continued): Study J, unicode index, orientation 1: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E0K1	1	0	0	8	0.000000	0.000000	0.000000
E0K1	2	0	0	8	0.000000	0.000000	0.000000
E0K1	3	0	0	8	0.000000	0.000000	0.000000
E0K1	4	0	0	8	0.000000	0.000000	0.000000
E0K2	1	0	0	8	0.000000	0.000000	0.000000
E0K2	2	0	0	8	0.000000	0.000000	0.000000
E0K2	3	0	0	8	0.000000	0.000000	0.000000
E0K2	4	0	0	8	0.000000	0.000000	0.000000
E1K0	1	0	0	8	0.000000	0.000000	0.000000
E1K0	2	0	0	8	0.000000	0.000000	0.000000
E1K0	3	0	0	8	0.000000	0.000000	0.000000
E1K0	4	0	0	8	0.000000	0.000000	0.000000
E1K1	1	0	0	8	0.000000	0.000000	0.000000
E1K1	2	0	0	8	0.000000	0.000000	0.000000
E1K1	3	0	0	8	0.000000	0.000000	0.000000
E1K1	4	0	0	8	0.000000	0.000000	0.000000
E1K2	1	0	0	8	0.000000	0.000000	0.000000
E1K2	2	0	0	8	0.000000	0.000000	0.000000
E1K2	3	0	0	8	0.000000	0.000000	0.000000
E1K2	4	0	0	8	0.000000	0.000000	0.000000
E2K0	1	0	0	8	0.000000	0.000000	0.000000
E2K0	2	0	0	8	0.000000	0.000000	0.000000
E2K0	3	0	0	8	0.000000	0.000000	0.000000
E2K0	4	0	0	8	0.000000	0.000000	0.000000
E2K1	1	0	0	8	0.000000	0.000000	0.000000
E2K1	2	0	0	8	0.000000	0.000000	0.000000
E2K1	3	0	0	8	0.000000	0.000000	0.000000
E2K1	4	0	0	8	0.000000	0.000000	0.000000
E2K2	1	0	0	8	0.000000	0.000000	0.000000
E2K2	2	0	0	8	0.000000	0.000000	0.000000
E2K2	3	0	0	8	0.000000	0.000000	0.000000
E2K2	4	0	0	8	0.000000	0.000000	0.000000

Failure and unknown categories

Table 100: Study J, unicode index, orientation 1: every registered failure and unknown category, including zeros.

Cell	C	I	M	A	T	P	R	U
E0K0	0	0	0	0	0	8	0	0
E0K1	0	0	0	0	0	8	0	0
E0K2	0	0	0	0	0	8	0	0
E1K0	0	0	0	0	0	8	0	0
E1K1	0	0	0	0	0	8	0	0
E1K2	0	0	0	0	0	8	0	0
E2K0	0	0	0	0	0	8	0	0
E2K1	0	0	0	0	0	8	0	0
E2K2	0	0	0	0	0	8	0	0

Recorded resources

Table 101: Study J, unicode index, orientation 1: recorded totals with unknown and planned opportunities retained; not comparative efficiency estimands.

Cell	Resource	Recorded total	U	N
E0K0	Time (s)	113.239227	0	8
E0K0	Trajectory (B)	3672	0	8
E0K0	Artifact (B)	0	0	8
E0K1	Time (s)	112.560200	0	8
E0K1	Trajectory (B)	3672	0	8
E0K1	Artifact (B)	0	0	8
E0K2	Time (s)	113.368653	0	8
E0K2	Trajectory (B)	3672	0	8
E0K2	Artifact (B)	0	0	8
E1K0	Time (s)	112.956438	0	8
E1K0	Trajectory (B)	3672	0	8
E1K0	Artifact (B)	0	0	8
E1K1	Time (s)	113.369538	0	8
E1K1	Trajectory (B)	3672	0	8
E1K1	Artifact (B)	0	0	8
E1K2	Time (s)	113.388360	0	8
E1K2	Trajectory (B)	3672	0	8
E1K2	Artifact (B)	0	0	8
E2K0	Time (s)	112.342723	0	8
E2K0	Trajectory (B)	3672	0	8
E2K0	Artifact (B)	0	0	8
E2K1	Time (s)	112.152352	0	8
E2K1	Trajectory (B)	3672	0	8
E2K1	Artifact (B)	0	0	8
E2K2	Time (s)	111.761466	0	8
E2K2	Trajectory (B)	3672	0	8
E2K2	Artifact (B)	0	0	8

All descriptive contrasts

Table 102: Study J, unicode index, orientation 1: all descriptive contrasts in fixed order; lower/upper are arithmetic missingness bounds, not confidence intervals.

Contrast	Point	Lower	Upper	U comp.
E0: K1 - K0	0.000000	0.000000	0.000000	0
E0: K2 - K0	0.000000	0.000000	0.000000	0
E0: K1 - K2	0.000000	0.000000	0.000000	0
E1: K1 - K0	0.000000	0.000000	0.000000	0
E1: K2 - K0	0.000000	0.000000	0.000000	0
E1: K1 - K2	0.000000	0.000000	0.000000	0
E2: K1 - K0	0.000000	0.000000	0.000000	0
E2: K2 - K0	0.000000	0.000000	0.000000	0
E2: K1 - K2	0.000000	0.000000	0.000000	0
K0: E1 - E0	0.000000	0.000000	0.000000	0

Continued on next page

Table 102 (continued): Study J, unicode index, orientation 1: all descriptive contrasts in fixed order; lower/upper are arithmetic missingness bounds, not confidence intervals.

Contrast	Point	Lower	Upper	U comp.
K0: E2 - E0	0.000000	0.000000	0.000000	0
K0: E2 - E1	0.000000	0.000000	0.000000	0
K1: E1 - E0	0.000000	0.000000	0.000000	0
K1: E2 - E0	0.000000	0.000000	0.000000	0
K1: E2 - E1	0.000000	0.000000	0.000000	0
K2: E1 - E0	0.000000	0.000000	0.000000	0
K2: E2 - E0	0.000000	0.000000	0.000000	0
K2: E2 - E1	0.000000	0.000000	0.000000	0
(E0 - E1): (K1 - K0)	0.000000	0.000000	0.000000	0
(E0 - E1): (K2 - K0)	0.000000	0.000000	0.000000	0
(E0 - E1): (K1 - K2)	0.000000	0.000000	0.000000	0
(E0 - E2): (K1 - K0)	0.000000	0.000000	0.000000	0
(E0 - E2): (K2 - K0)	0.000000	0.000000	0.000000	0
(E0 - E2): (K1 - K2)	0.000000	0.000000	0.000000	0
(E1 - E2): (K1 - K0)	0.000000	0.000000	0.000000	0
(E1 - E2): (K2 - K0)	0.000000	0.000000	0.000000	0
(E1 - E2): (K1 - K2)	0.000000	0.000000	0.000000	0

I.19 Route manifest, orientation 0

Complete execution

Table 103: Study J, route manifest, orientation 0: complete successes and arithmetic missingness bounds.

Cell	S	U	N	Point	Lower	Upper
E0K0	0	0	8	0.000000	0.000000	0.000000
E0K1	0	0	8	0.000000	0.000000	0.000000
E0K2	0	0	8	0.000000	0.000000	0.000000
E1K0	0	0	8	0.000000	0.000000	0.000000
E1K1	0	0	8	0.000000	0.000000	0.000000
E1K2	0	0	8	0.000000	0.000000	0.000000
E2K0	0	0	8	0.000000	0.000000	0.000000
E2K1	0	0	8	0.000000	0.000000	0.000000
E2K2	0	0	8	0.000000	0.000000	0.000000

Dependent target positions

Table 104: Study J, route manifest, orientation 0: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E0K0	1	0	0	8	0.000000	0.000000	0.000000
E0K0	2	0	0	8	0.000000	0.000000	0.000000
E0K0	3	0	0	8	0.000000	0.000000	0.000000
E0K0	4	0	0	8	0.000000	0.000000	0.000000

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Table 104 (continued): Study J, route manifest, orientation 0: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E0K1	1	0	0	8	0.000000	0.000000	0.000000
E0K1	2	0	0	8	0.000000	0.000000	0.000000
E0K1	3	0	0	8	0.000000	0.000000	0.000000
E0K1	4	0	0	8	0.000000	0.000000	0.000000
E0K2	1	0	0	8	0.000000	0.000000	0.000000
E0K2	2	0	0	8	0.000000	0.000000	0.000000
E0K2	3	0	0	8	0.000000	0.000000	0.000000
E0K2	4	0	0	8	0.000000	0.000000	0.000000
E1K0	1	0	0	8	0.000000	0.000000	0.000000
E1K0	2	0	0	8	0.000000	0.000000	0.000000
E1K0	3	0	0	8	0.000000	0.000000	0.000000
E1K0	4	0	0	8	0.000000	0.000000	0.000000
E1K1	1	0	0	8	0.000000	0.000000	0.000000
E1K1	2	0	0	8	0.000000	0.000000	0.000000
E1K1	3	0	0	8	0.000000	0.000000	0.000000
E1K1	4	0	0	8	0.000000	0.000000	0.000000
E1K2	1	0	0	8	0.000000	0.000000	0.000000
E1K2	2	0	0	8	0.000000	0.000000	0.000000
E1K2	3	0	0	8	0.000000	0.000000	0.000000
E1K2	4	0	0	8	0.000000	0.000000	0.000000
E2K0	1	0	0	8	0.000000	0.000000	0.000000
E2K0	2	0	0	8	0.000000	0.000000	0.000000
E2K0	3	0	0	8	0.000000	0.000000	0.000000
E2K0	4	0	0	8	0.000000	0.000000	0.000000
E2K1	1	0	0	8	0.000000	0.000000	0.000000
E2K1	2	0	0	8	0.000000	0.000000	0.000000
E2K1	3	0	0	8	0.000000	0.000000	0.000000
E2K1	4	0	0	8	0.000000	0.000000	0.000000
E2K2	1	0	0	8	0.000000	0.000000	0.000000
E2K2	2	0	0	8	0.000000	0.000000	0.000000
E2K2	3	0	0	8	0.000000	0.000000	0.000000
E2K2	4	0	0	8	0.000000	0.000000	0.000000

Failure and unknown categories

Table 105: Study J, route manifest, orientation 0: every registered failure and unknown category, including zeros.

Cell	C	I	M	A	T	P	R	U
E0K0	0	0	0	0	0	8	0	0
E0K1	0	0	0	0	0	8	0	0
E0K2	0	0	0	0	0	8	0	0
E1K0	0	0	0	0	0	8	0	0
E1K1	0	0	0	0	0	8	0	0
E1K2	0	0	0	0	0	8	0	0
E2K0	0	0	0	0	0	8	0	0
E2K1	0	0	0	0	0	8	0	0
E2K2	0	0	0	0	0	8	0	0

Recorded resources

Table 106: Study J, route manifest, orientation 0: recorded totals with unknown and planned opportunities retained; not comparative efficiency estimands.

Cell	Resource	Recorded total	U	N
E0K0	Time (s)	111.283489	0	8
E0K0	Trajectory (B)	3672	0	8
E0K0	Artifact (B)	0	0	8
E0K1	Time (s)	112.349721	0	8
E0K1	Trajectory (B)	3672	0	8
E0K1	Artifact (B)	0	0	8
E0K2	Time (s)	109.828763	0	8
E0K2	Trajectory (B)	3672	0	8
E0K2	Artifact (B)	0	0	8
E1K0	Time (s)	116.017526	0	8
E1K0	Trajectory (B)	3672	0	8
E1K0	Artifact (B)	0	0	8
E1K1	Time (s)	115.294418	0	8
E1K1	Trajectory (B)	3672	0	8
E1K1	Artifact (B)	0	0	8
E1K2	Time (s)	113.759381	0	8
E1K2	Trajectory (B)	3672	0	8
E1K2	Artifact (B)	0	0	8
E2K0	Time (s)	112.321695	0	8
E2K0	Trajectory (B)	3672	0	8
E2K0	Artifact (B)	0	0	8
E2K1	Time (s)	111.315840	0	8
E2K1	Trajectory (B)	3672	0	8
E2K1	Artifact (B)	0	0	8
E2K2	Time (s)	114.272094	0	8
E2K2	Trajectory (B)	3868	0	8
E2K2	Artifact (B)	0	0	8

All descriptive contrasts

Table 107: Study J, route manifest, orientation 0: all descriptive contrasts in fixed order; lower/upper are arithmetic missingness bounds, not confidence intervals.

Contrast	Point	Lower	Upper	U comp.
E0: K1 - K0	0.000000	0.000000	0.000000	0
E0: K2 - K0	0.000000	0.000000	0.000000	0
E0: K1 - K2	0.000000	0.000000	0.000000	0
E1: K1 - K0	0.000000	0.000000	0.000000	0
E1: K2 - K0	0.000000	0.000000	0.000000	0
E1: K1 - K2	0.000000	0.000000	0.000000	0
E2: K1 - K0	0.000000	0.000000	0.000000	0
E2: K2 - K0	0.000000	0.000000	0.000000	0
E2: K1 - K2	0.000000	0.000000	0.000000	0
K0: E1 - E0	0.000000	0.000000	0.000000	0

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Table 107 (continued): Study J, route manifest, orientation 0: all descriptive contrasts in fixed order; lower/upper are arithmetic missingness bounds, not confidence intervals.

Contrast	Point	Lower	Upper	U comp.
K0: E2 - E0	0.000000	0.000000	0.000000	0
K0: E2 - E1	0.000000	0.000000	0.000000	0
K1: E1 - E0	0.000000	0.000000	0.000000	0
K1: E2 - E0	0.000000	0.000000	0.000000	0
K1: E2 - E1	0.000000	0.000000	0.000000	0
K2: E1 - E0	0.000000	0.000000	0.000000	0
K2: E2 - E0	0.000000	0.000000	0.000000	0
K2: E2 - E1	0.000000	0.000000	0.000000	0
(E0 - E1): (K1 - K0)	0.000000	0.000000	0.000000	0
(E0 - E1): (K2 - K0)	0.000000	0.000000	0.000000	0
(E0 - E1): (K1 - K2)	0.000000	0.000000	0.000000	0
(E0 - E2): (K1 - K0)	0.000000	0.000000	0.000000	0
(E0 - E2): (K2 - K0)	0.000000	0.000000	0.000000	0
(E0 - E2): (K1 - K2)	0.000000	0.000000	0.000000	0
(E1 - E2): (K1 - K0)	0.000000	0.000000	0.000000	0
(E1 - E2): (K2 - K0)	0.000000	0.000000	0.000000	0
(E1 - E2): (K1 - K2)	0.000000	0.000000	0.000000	0

I.20 Route manifest, orientation 1

Complete execution

Table 108: Study J, route manifest, orientation 1: complete successes and arithmetic missingness bounds.

Cell	S	U	N	Point	Lower	Upper
E0K0	0	0	8	0.000000	0.000000	0.000000
E0K1	0	0	8	0.000000	0.000000	0.000000
E0K2	0	0	8	0.000000	0.000000	0.000000
E1K0	0	0	8	0.000000	0.000000	0.000000
E1K1	0	0	8	0.000000	0.000000	0.000000
E1K2	0	0	8	0.000000	0.000000	0.000000
E2K0	0	0	8	0.000000	0.000000	0.000000
E2K1	0	0	8	0.000000	0.000000	0.000000
E2K2	0	0	8	0.000000	0.000000	0.000000

Dependent target positions

Table 109: Study J, route manifest, orientation 1: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E0K0	1	0	0	8	0.000000	0.000000	0.000000
E0K0	2	0	0	8	0.000000	0.000000	0.000000
E0K0	3	0	0	8	0.000000	0.000000	0.000000
E0K0	4	0	0	8	0.000000	0.000000	0.000000

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Table 109 (continued): Study J, route manifest, orientation 1: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E0K1	1	0	0	8	0.000000	0.000000	0.000000
E0K1	2	0	0	8	0.000000	0.000000	0.000000
E0K1	3	0	0	8	0.000000	0.000000	0.000000
E0K1	4	0	0	8	0.000000	0.000000	0.000000
E0K2	1	0	0	8	0.000000	0.000000	0.000000
E0K2	2	0	0	8	0.000000	0.000000	0.000000
E0K2	3	0	0	8	0.000000	0.000000	0.000000
E0K2	4	0	0	8	0.000000	0.000000	0.000000
E1K0	1	0	0	8	0.000000	0.000000	0.000000
E1K0	2	0	0	8	0.000000	0.000000	0.000000
E1K0	3	0	0	8	0.000000	0.000000	0.000000
E1K0	4	0	0	8	0.000000	0.000000	0.000000
E1K1	1	0	0	8	0.000000	0.000000	0.000000
E1K1	2	0	0	8	0.000000	0.000000	0.000000
E1K1	3	0	0	8	0.000000	0.000000	0.000000
E1K1	4	0	0	8	0.000000	0.000000	0.000000
E1K2	1	0	0	8	0.000000	0.000000	0.000000
E1K2	2	0	0	8	0.000000	0.000000	0.000000
E1K2	3	0	0	8	0.000000	0.000000	0.000000
E1K2	4	0	0	8	0.000000	0.000000	0.000000
E2K0	1	0	0	8	0.000000	0.000000	0.000000
E2K0	2	0	0	8	0.000000	0.000000	0.000000
E2K0	3	0	0	8	0.000000	0.000000	0.000000
E2K0	4	0	0	8	0.000000	0.000000	0.000000
E2K1	1	0	0	8	0.000000	0.000000	0.000000
E2K1	2	0	0	8	0.000000	0.000000	0.000000
E2K1	3	0	0	8	0.000000	0.000000	0.000000
E2K1	4	0	0	8	0.000000	0.000000	0.000000
E2K2	1	0	0	8	0.000000	0.000000	0.000000
E2K2	2	0	0	8	0.000000	0.000000	0.000000
E2K2	3	0	0	8	0.000000	0.000000	0.000000
E2K2	4	0	0	8	0.000000	0.000000	0.000000

Failure and unknown categories

Table 110: Study J, route manifest, orientation 1: every registered failure and unknown category, including zeros.

Cell	C	I	M	A	T	P	R	U
E0K0	0	0	0	0	0	8	0	0
E0K1	0	0	0	0	0	8	0	0
E0K2	0	0	0	0	0	8	0	0
E1K0	0	0	0	0	0	8	0	0
E1K1	0	0	0	0	0	8	0	0
E1K2	0	0	0	0	0	8	0	0
E2K0	0	0	0	0	0	8	0	0
E2K1	0	0	0	0	0	8	0	0
E2K2	0	0	0	0	0	8	0	0

Recorded resources

Table 111: Study J, route manifest, orientation 1: recorded totals with unknown and planned opportunities retained; not comparative efficiency estimands.

Cell	Resource	Recorded total	U	N
E0K0	Time (s)	118.737026	0	8
E0K0	Trajectory (B)	3672	0	8
E0K0	Artifact (B)	0	0	8
E0K1	Time (s)	119.880782	0	8
E0K1	Trajectory (B)	3672	0	8
E0K1	Artifact (B)	0	0	8
E0K2	Time (s)	115.699349	0	8
E0K2	Trajectory (B)	3672	0	8
E0K2	Artifact (B)	0	0	8
E1K0	Time (s)	121.229742	0	8
E1K0	Trajectory (B)	3672	0	8
E1K0	Artifact (B)	0	0	8
E1K1	Time (s)	119.291402	0	8
E1K1	Trajectory (B)	3672	0	8
E1K1	Artifact (B)	0	0	8
E1K2	Time (s)	116.933693	0	8
E1K2	Trajectory (B)	3672	0	8
E1K2	Artifact (B)	0	0	8
E2K0	Time (s)	121.823058	0	8
E2K0	Trajectory (B)	3672	0	8
E2K0	Artifact (B)	0	0	8
E2K1	Time (s)	119.516387	0	8
E2K1	Trajectory (B)	3672	0	8
E2K1	Artifact (B)	0	0	8
E2K2	Time (s)	119.282572	0	8
E2K2	Trajectory (B)	3672	0	8
E2K2	Artifact (B)	0	0	8

All descriptive contrasts

Table 112: Study J, route manifest, orientation 1: all descriptive contrasts in fixed order; lower/upper are arithmetic missingness bounds, not confidence intervals.

Contrast	Point	Lower	Upper	U comp.
E0: K1 - K0	0.000000	0.000000	0.000000	0
E0: K2 - K0	0.000000	0.000000	0.000000	0
E0: K1 - K2	0.000000	0.000000	0.000000	0
E1: K1 - K0	0.000000	0.000000	0.000000	0
E1: K2 - K0	0.000000	0.000000	0.000000	0
E1: K1 - K2	0.000000	0.000000	0.000000	0
E2: K1 - K0	0.000000	0.000000	0.000000	0
E2: K2 - K0	0.000000	0.000000	0.000000	0
E2: K1 - K2	0.000000	0.000000	0.000000	0
K0: E1 - E0	0.000000	0.000000	0.000000	0

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Table 112 (continued): Study J, route manifest, orientation 1: all descriptive contrasts in fixed order; lower/upper are arithmetic missingness bounds, not confidence intervals.

Contrast	Point	Lower	Upper	U comp.
K0: E2 - E0	0.000000	0.000000	0.000000	0
K0: E2 - E1	0.000000	0.000000	0.000000	0
K1: E1 - E0	0.000000	0.000000	0.000000	0
K1: E2 - E0	0.000000	0.000000	0.000000	0
K1: E2 - E1	0.000000	0.000000	0.000000	0
K2: E1 - E0	0.000000	0.000000	0.000000	0
K2: E2 - E0	0.000000	0.000000	0.000000	0
K2: E2 - E1	0.000000	0.000000	0.000000	0
(E0 - E1): (K1 - K0)	0.000000	0.000000	0.000000	0
(E0 - E1): (K2 - K0)	0.000000	0.000000	0.000000	0
(E0 - E1): (K1 - K2)	0.000000	0.000000	0.000000	0
(E0 - E2): (K1 - K0)	0.000000	0.000000	0.000000	0
(E0 - E2): (K2 - K0)	0.000000	0.000000	0.000000	0
(E0 - E2): (K1 - K2)	0.000000	0.000000	0.000000	0
(E1 - E2): (K1 - K0)	0.000000	0.000000	0.000000	0
(E1 - E2): (K2 - K0)	0.000000	0.000000	0.000000	0
(E1 - E2): (K1 - K2)	0.000000	0.000000	0.000000	0

I.21 Grouped nullable counts, orientation 0

Complete execution

Table 113: Study J, grouped nullable counts, orientation 0: complete successes and arithmetic missingness bounds.

Cell	S	U	N	Point	Lower	Upper
E0K0	0	0	8	0.000000	0.000000	0.000000
E0K1	0	0	8	0.000000	0.000000	0.000000
E0K2	0	0	8	0.000000	0.000000	0.000000
E1K0	0	0	8	0.000000	0.000000	0.000000
E1K1	0	0	8	0.000000	0.000000	0.000000
E1K2	0	0	8	0.000000	0.000000	0.000000
E2K0	0	0	8	0.000000	0.000000	0.000000
E2K1	0	0	8	0.000000	0.000000	0.000000
E2K2	0	0	8	0.000000	0.000000	0.000000

Dependent target positions

Table 114: Study J, grouped nullable counts, orientation 0: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E0K0	1	0	0	8	0.000000	0.000000	0.000000
E0K0	2	0	0	8	0.000000	0.000000	0.000000
E0K0	3	0	0	8	0.000000	0.000000	0.000000
E0K0	4	0	0	8	0.000000	0.000000	0.000000

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Table 114 (continued): Study J, grouped nullable counts, orientation 0: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E0K1	1	0	0	8	0.000000	0.000000	0.000000
E0K1	2	0	0	8	0.000000	0.000000	0.000000
E0K1	3	0	0	8	0.000000	0.000000	0.000000
E0K1	4	0	0	8	0.000000	0.000000	0.000000
E0K2	1	0	0	8	0.000000	0.000000	0.000000
E0K2	2	0	0	8	0.000000	0.000000	0.000000
E0K2	3	0	0	8	0.000000	0.000000	0.000000
E0K2	4	0	0	8	0.000000	0.000000	0.000000
E1K0	1	0	0	8	0.000000	0.000000	0.000000
E1K0	2	0	0	8	0.000000	0.000000	0.000000
E1K0	3	0	0	8	0.000000	0.000000	0.000000
E1K0	4	0	0	8	0.000000	0.000000	0.000000
E1K1	1	0	0	8	0.000000	0.000000	0.000000
E1K1	2	0	0	8	0.000000	0.000000	0.000000
E1K1	3	0	0	8	0.000000	0.000000	0.000000
E1K1	4	0	0	8	0.000000	0.000000	0.000000
E1K2	1	0	0	8	0.000000	0.000000	0.000000
E1K2	2	0	0	8	0.000000	0.000000	0.000000
E1K2	3	0	0	8	0.000000	0.000000	0.000000
E1K2	4	0	0	8	0.000000	0.000000	0.000000
E2K0	1	0	0	8	0.000000	0.000000	0.000000
E2K0	2	0	0	8	0.000000	0.000000	0.000000
E2K0	3	0	0	8	0.000000	0.000000	0.000000
E2K0	4	0	0	8	0.000000	0.000000	0.000000
E2K1	1	0	0	8	0.000000	0.000000	0.000000
E2K1	2	0	0	8	0.000000	0.000000	0.000000
E2K1	3	0	0	8	0.000000	0.000000	0.000000
E2K1	4	0	0	8	0.000000	0.000000	0.000000
E2K2	1	0	0	8	0.000000	0.000000	0.000000
E2K2	2	0	0	8	0.000000	0.000000	0.000000
E2K2	3	0	0	8	0.000000	0.000000	0.000000
E2K2	4	0	0	8	0.000000	0.000000	0.000000

Failure and unknown categories

Table 115: Study J, grouped nullable counts, orientation 0: every registered failure and unknown category, including zeros.

Cell	C	I	M	A	T	P	R	U
E0K0	0	0	0	0	0	8	0	0
E0K1	0	0	0	0	0	8	0	0
E0K2	0	0	0	0	0	8	0	0
E1K0	0	0	0	0	0	8	0	0
E1K1	0	0	0	0	0	8	0	0
E1K2	0	0	0	0	0	8	0	0
E2K0	0	0	0	0	0	8	0	0
E2K1	0	0	0	0	0	8	0	0
E2K2	0	0	0	0	0	8	0	0

Recorded resources

Table 116: Study J, grouped nullable counts, orientation 0: recorded totals with unknown and planned opportunities retained; not comparative efficiency estimands.

Cell	Resource	Recorded total	U	N
E0K0	Time (s)	134.044147	0	8
E0K0	Trajectory (B)	3672	0	8
E0K0	Artifact (B)	0	0	8
E0K1	Time (s)	132.971949	0	8
E0K1	Trajectory (B)	3672	0	8
E0K1	Artifact (B)	0	0	8
E0K2	Time (s)	132.021343	0	8
E0K2	Trajectory (B)	3672	0	8
E0K2	Artifact (B)	0	0	8
E1K0	Time (s)	132.385120	0	8
E1K0	Trajectory (B)	3672	0	8
E1K0	Artifact (B)	0	0	8
E1K1	Time (s)	136.168608	0	8
E1K1	Trajectory (B)	3672	0	8
E1K1	Artifact (B)	0	0	8
E1K2	Time (s)	132.525196	0	8
E1K2	Trajectory (B)	3672	0	8
E1K2	Artifact (B)	0	0	8
E2K0	Time (s)	133.260117	0	8
E2K0	Trajectory (B)	3672	0	8
E2K0	Artifact (B)	0	0	8
E2K1	Time (s)	133.883760	0	8
E2K1	Trajectory (B)	3672	0	8
E2K1	Artifact (B)	0	0	8
E2K2	Time (s)	132.334711	0	8
E2K2	Trajectory (B)	3672	0	8
E2K2	Artifact (B)	0	0	8

All descriptive contrasts

Table 117: Study J, grouped nullable counts, orientation 0: all descriptive contrasts in fixed order; lower/upper are arithmetic missingness bounds, not confidence intervals.

Contrast	Point	Lower	Upper	U comp.
E0: K1 - K0	0.000000	0.000000	0.000000	0
E0: K2 - K0	0.000000	0.000000	0.000000	0
E0: K1 - K2	0.000000	0.000000	0.000000	0
E1: K1 - K0	0.000000	0.000000	0.000000	0
E1: K2 - K0	0.000000	0.000000	0.000000	0
E1: K1 - K2	0.000000	0.000000	0.000000	0
E2: K1 - K0	0.000000	0.000000	0.000000	0
E2: K2 - K0	0.000000	0.000000	0.000000	0
E2: K1 - K2	0.000000	0.000000	0.000000	0
K0: E1 - E0	0.000000	0.000000	0.000000	0

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Table 117 (continued): Study J, grouped nullable counts, orientation 0: all descriptive contrasts in fixed order; lower/upper are arithmetic missingness bounds, not confidence intervals.

Contrast	Point	Lower	Upper	U comp.
K0: E2 - E0	0.000000	0.000000	0.000000	0
K0: E2 - E1	0.000000	0.000000	0.000000	0
K1: E1 - E0	0.000000	0.000000	0.000000	0
K1: E2 - E0	0.000000	0.000000	0.000000	0
K1: E2 - E1	0.000000	0.000000	0.000000	0
K2: E1 - E0	0.000000	0.000000	0.000000	0
K2: E2 - E0	0.000000	0.000000	0.000000	0
K2: E2 - E1	0.000000	0.000000	0.000000	0
(E0 - E1): (K1 - K0)	0.000000	0.000000	0.000000	0
(E0 - E1): (K2 - K0)	0.000000	0.000000	0.000000	0
(E0 - E1): (K1 - K2)	0.000000	0.000000	0.000000	0
(E0 - E2): (K1 - K0)	0.000000	0.000000	0.000000	0
(E0 - E2): (K2 - K0)	0.000000	0.000000	0.000000	0
(E0 - E2): (K1 - K2)	0.000000	0.000000	0.000000	0
(E1 - E2): (K1 - K0)	0.000000	0.000000	0.000000	0
(E1 - E2): (K2 - K0)	0.000000	0.000000	0.000000	0
(E1 - E2): (K1 - K2)	0.000000	0.000000	0.000000	0

I.22 Grouped nullable counts, orientation 1

Complete execution

Table 118: Study J, grouped nullable counts, orientation 1: complete successes and arithmetic missingness bounds.

Cell	S	U	N	Point	Lower	Upper
E0K0	0	0	8	0.000000	0.000000	0.000000
E0K1	0	0	8	0.000000	0.000000	0.000000
E0K2	0	0	8	0.000000	0.000000	0.000000
E1K0	0	0	8	0.000000	0.000000	0.000000
E1K1	0	0	8	0.000000	0.000000	0.000000
E1K2	0	0	8	0.000000	0.000000	0.000000
E2K0	0	0	8	0.000000	0.000000	0.000000
E2K1	0	0	8	0.000000	0.000000	0.000000
E2K2	0	0	8	0.000000	0.000000	0.000000

Dependent target positions

Table 119: Study J, grouped nullable counts, orientation 1: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E0K0	1	0	0	8	0.000000	0.000000	0.000000
E0K0	2	0	0	8	0.000000	0.000000	0.000000
E0K0	3	0	0	8	0.000000	0.000000	0.000000
E0K0	4	0	0	8	0.000000	0.000000	0.000000

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Table 119 (continued): Study J, grouped nullable counts, orientation 1: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E0K1	1	0	0	8	0.000000	0.000000	0.000000
E0K1	2	0	0	8	0.000000	0.000000	0.000000
E0K1	3	0	0	8	0.000000	0.000000	0.000000
E0K1	4	0	0	8	0.000000	0.000000	0.000000
E0K2	1	0	0	8	0.000000	0.000000	0.000000
E0K2	2	0	0	8	0.000000	0.000000	0.000000
E0K2	3	0	0	8	0.000000	0.000000	0.000000
E0K2	4	0	0	8	0.000000	0.000000	0.000000
E1K0	1	0	0	8	0.000000	0.000000	0.000000
E1K0	2	0	0	8	0.000000	0.000000	0.000000
E1K0	3	0	0	8	0.000000	0.000000	0.000000
E1K0	4	0	0	8	0.000000	0.000000	0.000000
E1K1	1	0	0	8	0.000000	0.000000	0.000000
E1K1	2	0	0	8	0.000000	0.000000	0.000000
E1K1	3	0	0	8	0.000000	0.000000	0.000000
E1K1	4	0	0	8	0.000000	0.000000	0.000000
E1K2	1	0	0	8	0.000000	0.000000	0.000000
E1K2	2	0	0	8	0.000000	0.000000	0.000000
E1K2	3	0	0	8	0.000000	0.000000	0.000000
E1K2	4	0	0	8	0.000000	0.000000	0.000000
E2K0	1	0	0	8	0.000000	0.000000	0.000000
E2K0	2	0	0	8	0.000000	0.000000	0.000000
E2K0	3	0	0	8	0.000000	0.000000	0.000000
E2K0	4	0	0	8	0.000000	0.000000	0.000000
E2K1	1	0	0	8	0.000000	0.000000	0.000000
E2K1	2	0	0	8	0.000000	0.000000	0.000000
E2K1	3	0	0	8	0.000000	0.000000	0.000000
E2K1	4	0	0	8	0.000000	0.000000	0.000000
E2K2	1	0	0	8	0.000000	0.000000	0.000000
E2K2	2	0	0	8	0.000000	0.000000	0.000000
E2K2	3	0	0	8	0.000000	0.000000	0.000000
E2K2	4	0	0	8	0.000000	0.000000	0.000000

Failure and unknown categories

Table 120: Study J, grouped nullable counts, orientation 1: every registered failure and unknown category, including zeros.

Cell	C	I	M	A	T	P	R	U
E0K0	0	0	0	0	0	8	0	0
E0K1	0	0	0	0	0	8	0	0
E0K2	0	0	0	0	0	8	0	0
E1K0	0	0	0	0	0	8	0	0
E1K1	0	0	0	0	0	8	0	0
E1K2	0	0	0	0	0	8	0	0
E2K0	0	0	0	0	0	8	0	0
E2K1	0	0	0	0	0	8	0	0
E2K2	0	0	0	0	0	8	0	0

Recorded resources

Table 121: Study J, grouped nullable counts, orientation 1: recorded totals with unknown and planned opportunities retained; not comparative efficiency estimands.

Cell	Resource	Recorded total	U	N
E0K0	Time (s)	114.686625	0	8
E0K0	Trajectory (B)	3672	0	8
E0K0	Artifact (B)	0	0	8
E0K1	Time (s)	112.252876	0	8
E0K1	Trajectory (B)	3672	0	8
E0K1	Artifact (B)	0	0	8
E0K2	Time (s)	114.605053	0	8
E0K2	Trajectory (B)	3672	0	8
E0K2	Artifact (B)	0	0	8
E1K0	Time (s)	115.656302	0	8
E1K0	Trajectory (B)	3672	0	8
E1K0	Artifact (B)	0	0	8
E1K1	Time (s)	115.033621	0	8
E1K1	Trajectory (B)	3672	0	8
E1K1	Artifact (B)	0	0	8
E1K2	Time (s)	115.501826	0	8
E1K2	Trajectory (B)	3672	0	8
E1K2	Artifact (B)	0	0	8
E2K0	Time (s)	115.508137	0	8
E2K0	Trajectory (B)	3672	0	8
E2K0	Artifact (B)	0	0	8
E2K1	Time (s)	114.460033	0	8
E2K1	Trajectory (B)	3815	0	8
E2K1	Artifact (B)	0	0	8
E2K2	Time (s)	114.983483	0	8
E2K2	Trajectory (B)	3672	0	8
E2K2	Artifact (B)	0	0	8

All descriptive contrasts

Table 122: Study J, grouped nullable counts, orientation 1: all descriptive contrasts in fixed order; lower/upper are arithmetic missingness bounds, not confidence intervals.

Contrast	Point	Lower	Upper	U comp.
E0: K1 - K0	0.000000	0.000000	0.000000	0
E0: K2 - K0	0.000000	0.000000	0.000000	0
E0: K1 - K2	0.000000	0.000000	0.000000	0
E1: K1 - K0	0.000000	0.000000	0.000000	0
E1: K2 - K0	0.000000	0.000000	0.000000	0
E1: K1 - K2	0.000000	0.000000	0.000000	0
E2: K1 - K0	0.000000	0.000000	0.000000	0
E2: K2 - K0	0.000000	0.000000	0.000000	0
E2: K1 - K2	0.000000	0.000000	0.000000	0
K0: E1 - E0	0.000000	0.000000	0.000000	0

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Table 122 (continued): Study J, grouped nullable counts, orientation 1: all descriptive contrasts in fixed order; lower/upper are arithmetic missingness bounds, not confidence intervals.

Contrast	Point	Lower	Upper	U comp.
K0: E2 - E0	0.000000	0.000000	0.000000	0
K0: E2 - E1	0.000000	0.000000	0.000000	0
K1: E1 - E0	0.000000	0.000000	0.000000	0
K1: E2 - E0	0.000000	0.000000	0.000000	0
K1: E2 - E1	0.000000	0.000000	0.000000	0
K2: E1 - E0	0.000000	0.000000	0.000000	0
K2: E2 - E0	0.000000	0.000000	0.000000	0
K2: E2 - E1	0.000000	0.000000	0.000000	0
(E0 - E1): (K1 - K0)	0.000000	0.000000	0.000000	0
(E0 - E1): (K2 - K0)	0.000000	0.000000	0.000000	0
(E0 - E1): (K1 - K2)	0.000000	0.000000	0.000000	0
(E0 - E2): (K1 - K0)	0.000000	0.000000	0.000000	0
(E0 - E2): (K2 - K0)	0.000000	0.000000	0.000000	0
(E0 - E2): (K1 - K2)	0.000000	0.000000	0.000000	0
(E1 - E2): (K1 - K0)	0.000000	0.000000	0.000000	0
(E1 - E2): (K2 - K0)	0.000000	0.000000	0.000000	0
(E1 - E2): (K1 - K2)	0.000000	0.000000	0.000000	0

I.23 Checksum manifest, orientation 0

Complete execution

Table 123: Study J, checksum manifest, orientation 0: complete successes and arithmetic missingness bounds.

Cell	S	U	N	Point	Lower	Upper
E0K0	0	0	8	0.000000	0.000000	0.000000
E0K1	0	0	8	0.000000	0.000000	0.000000
E0K2	0	0	8	0.000000	0.000000	0.000000
E1K0	0	0	8	0.000000	0.000000	0.000000
E1K1	0	0	8	0.000000	0.000000	0.000000
E1K2	0	0	8	0.000000	0.000000	0.000000
E2K0	0	0	8	0.000000	0.000000	0.000000
E2K1	0	0	8	0.000000	0.000000	0.000000
E2K2	0	0	8	0.000000	0.000000	0.000000

Dependent target positions

Table 124: Study J, checksum manifest, orientation 0: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E0K0	1	0	0	8	0.000000	0.000000	0.000000
E0K0	2	0	0	8	0.000000	0.000000	0.000000
E0K0	3	0	0	8	0.000000	0.000000	0.000000
E0K0	4	0	0	8	0.000000	0.000000	0.000000

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Table 124 (continued): Study J, checksum manifest, orientation 0: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E0K1	1	0	0	8	0.000000	0.000000	0.000000
E0K1	2	0	0	8	0.000000	0.000000	0.000000
E0K1	3	0	0	8	0.000000	0.000000	0.000000
E0K1	4	0	0	8	0.000000	0.000000	0.000000
E0K2	1	0	0	8	0.000000	0.000000	0.000000
E0K2	2	0	0	8	0.000000	0.000000	0.000000
E0K2	3	0	0	8	0.000000	0.000000	0.000000
E0K2	4	0	0	8	0.000000	0.000000	0.000000
E1K0	1	0	0	8	0.000000	0.000000	0.000000
E1K0	2	0	0	8	0.000000	0.000000	0.000000
E1K0	3	0	0	8	0.000000	0.000000	0.000000
E1K0	4	0	0	8	0.000000	0.000000	0.000000
E1K1	1	0	0	8	0.000000	0.000000	0.000000
E1K1	2	0	0	8	0.000000	0.000000	0.000000
E1K1	3	0	0	8	0.000000	0.000000	0.000000
E1K1	4	0	0	8	0.000000	0.000000	0.000000
E1K2	1	0	0	8	0.000000	0.000000	0.000000
E1K2	2	0	0	8	0.000000	0.000000	0.000000
E1K2	3	0	0	8	0.000000	0.000000	0.000000
E1K2	4	0	0	8	0.000000	0.000000	0.000000
E2K0	1	0	0	8	0.000000	0.000000	0.000000
E2K0	2	0	0	8	0.000000	0.000000	0.000000
E2K0	3	0	0	8	0.000000	0.000000	0.000000
E2K0	4	0	0	8	0.000000	0.000000	0.000000
E2K1	1	0	0	8	0.000000	0.000000	0.000000
E2K1	2	0	0	8	0.000000	0.000000	0.000000
E2K1	3	0	0	8	0.000000	0.000000	0.000000
E2K1	4	0	0	8	0.000000	0.000000	0.000000
E2K2	1	0	0	8	0.000000	0.000000	0.000000
E2K2	2	0	0	8	0.000000	0.000000	0.000000
E2K2	3	0	0	8	0.000000	0.000000	0.000000
E2K2	4	0	0	8	0.000000	0.000000	0.000000

Failure and unknown categories

Table 125: Study J, checksum manifest, orientation 0: every registered failure and unknown category, including zeros.

Cell	C	I	M	A	T	P	R	U
E0K0	0	0	0	0	0	8	0	0
E0K1	0	0	0	0	0	8	0	0
E0K2	0	0	0	0	0	8	0	0
E1K0	0	0	0	0	0	8	0	0
E1K1	0	0	0	0	0	8	0	0
E1K2	0	0	0	0	0	8	0	0
E2K0	0	0	0	0	0	8	0	0
E2K1	0	0	0	0	0	8	0	0
E2K2	0	0	0	0	0	8	0	0

Recorded resources

Table 126: Study J, checksum manifest, orientation 0: recorded totals with unknown and planned opportunities retained; not comparative efficiency estimands.

Cell	Resource	Recorded total	U	N
E0K0	Time (s)	189.863133	0	8
E0K0	Trajectory (B)	6246	0	8
E0K0	Artifact (B)	0	0	8
E0K1	Time (s)	187.866785	0	8
E0K1	Trajectory (B)	6103	0	8
E0K1	Artifact (B)	0	0	8
E0K2	Time (s)	187.589442	0	8
E0K2	Trajectory (B)	6103	0	8
E0K2	Artifact (B)	0	0	8
E1K0	Time (s)	186.717735	0	8
E1K0	Trajectory (B)	5960	0	8
E1K0	Artifact (B)	0	0	8
E1K1	Time (s)	190.481757	0	8
E1K1	Trajectory (B)	6103	0	8
E1K1	Artifact (B)	0	0	8
E1K2	Time (s)	187.986519	0	8
E1K2	Trajectory (B)	5960	0	8
E1K2	Artifact (B)	0	0	8
E2K0	Time (s)	188.904335	0	8
E2K0	Trajectory (B)	5960	0	8
E2K0	Artifact (B)	0	0	8
E2K1	Time (s)	185.111404	0	8
E2K1	Trajectory (B)	5674	0	8
E2K1	Artifact (B)	0	0	8
E2K2	Time (s)	188.819241	0	8
E2K2	Trajectory (B)	6103	0	8
E2K2	Artifact (B)	0	0	8

All descriptive contrasts

Table 127: Study J, checksum manifest, orientation 0: all descriptive contrasts in fixed order; lower/upper are arithmetic missingness bounds, not confidence intervals.

Contrast	Point	Lower	Upper	U comp.
E0: K1 - K0	0.000000	0.000000	0.000000	0
E0: K2 - K0	0.000000	0.000000	0.000000	0
E0: K1 - K2	0.000000	0.000000	0.000000	0
E1: K1 - K0	0.000000	0.000000	0.000000	0
E1: K2 - K0	0.000000	0.000000	0.000000	0
E1: K1 - K2	0.000000	0.000000	0.000000	0
E2: K1 - K0	0.000000	0.000000	0.000000	0
E2: K2 - K0	0.000000	0.000000	0.000000	0
E2: K1 - K2	0.000000	0.000000	0.000000	0
K0: E1 - E0	0.000000	0.000000	0.000000	0

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Table 127 (continued): Study J, checksum manifest, orientation 0: all descriptive contrasts in fixed order; lower/upper are arithmetic missingness bounds, not confidence intervals.

Contrast	Point	Lower	Upper	U comp.
K0: E2 - E0	0.000000	0.000000	0.000000	0
K0: E2 - E1	0.000000	0.000000	0.000000	0
K1: E1 - E0	0.000000	0.000000	0.000000	0
K1: E2 - E0	0.000000	0.000000	0.000000	0
K1: E2 - E1	0.000000	0.000000	0.000000	0
K2: E1 - E0	0.000000	0.000000	0.000000	0
K2: E2 - E0	0.000000	0.000000	0.000000	0
K2: E2 - E1	0.000000	0.000000	0.000000	0
(E0 - E1): (K1 - K0)	0.000000	0.000000	0.000000	0
(E0 - E1): (K2 - K0)	0.000000	0.000000	0.000000	0
(E0 - E1): (K1 - K2)	0.000000	0.000000	0.000000	0
(E0 - E2): (K1 - K0)	0.000000	0.000000	0.000000	0
(E0 - E2): (K2 - K0)	0.000000	0.000000	0.000000	0
(E0 - E2): (K1 - K2)	0.000000	0.000000	0.000000	0
(E1 - E2): (K1 - K0)	0.000000	0.000000	0.000000	0
(E1 - E2): (K2 - K0)	0.000000	0.000000	0.000000	0
(E1 - E2): (K1 - K2)	0.000000	0.000000	0.000000	0

I.24 Checksum manifest, orientation 1

Complete execution

Table 128: Study J, checksum manifest, orientation 1: complete successes and arithmetic missingness bounds.

Cell	S	U	N	Point	Lower	Upper
E0K0	0	0	8	0.000000	0.000000	0.000000
E0K1	0	0	8	0.000000	0.000000	0.000000
E0K2	0	0	8	0.000000	0.000000	0.000000
E1K0	0	0	8	0.000000	0.000000	0.000000
E1K1	0	0	8	0.000000	0.000000	0.000000
E1K2	0	0	8	0.000000	0.000000	0.000000
E2K0	0	0	8	0.000000	0.000000	0.000000
E2K1	0	0	8	0.000000	0.000000	0.000000
E2K2	0	0	8	0.000000	0.000000	0.000000

Dependent target positions

Table 129: Study J, checksum manifest, orientation 1: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E0K0	1	0	0	8	0.000000	0.000000	0.000000
E0K0	2	0	0	8	0.000000	0.000000	0.000000
E0K0	3	0	0	8	0.000000	0.000000	0.000000
E0K0	4	0	0	8	0.000000	0.000000	0.000000

Continued on next page

Table 129 (continued): Study J, checksum manifest, orientation 1: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E0K1	1	0	0	8	0.000000	0.000000	0.000000
E0K1	2	0	0	8	0.000000	0.000000	0.000000
E0K1	3	0	0	8	0.000000	0.000000	0.000000
E0K1	4	0	0	8	0.000000	0.000000	0.000000
E0K2	1	0	0	8	0.000000	0.000000	0.000000
E0K2	2	0	0	8	0.000000	0.000000	0.000000
E0K2	3	0	0	8	0.000000	0.000000	0.000000
E0K2	4	0	0	8	0.000000	0.000000	0.000000
E1K0	1	0	0	8	0.000000	0.000000	0.000000
E1K0	2	0	0	8	0.000000	0.000000	0.000000
E1K0	3	0	0	8	0.000000	0.000000	0.000000
E1K0	4	0	0	8	0.000000	0.000000	0.000000
E1K1	1	0	0	8	0.000000	0.000000	0.000000
E1K1	2	0	0	8	0.000000	0.000000	0.000000
E1K1	3	0	0	8	0.000000	0.000000	0.000000
E1K1	4	0	0	8	0.000000	0.000000	0.000000
E1K2	1	0	0	8	0.000000	0.000000	0.000000
E1K2	2	0	0	8	0.000000	0.000000	0.000000
E1K2	3	0	0	8	0.000000	0.000000	0.000000
E1K2	4	0	0	8	0.000000	0.000000	0.000000
E2K0	1	0	0	8	0.000000	0.000000	0.000000
E2K0	2	0	0	8	0.000000	0.000000	0.000000
E2K0	3	0	0	8	0.000000	0.000000	0.000000
E2K0	4	0	0	8	0.000000	0.000000	0.000000
E2K1	1	0	0	8	0.000000	0.000000	0.000000
E2K1	2	0	0	8	0.000000	0.000000	0.000000
E2K1	3	0	0	8	0.000000	0.000000	0.000000
E2K1	4	0	0	8	0.000000	0.000000	0.000000
E2K2	1	0	0	8	0.000000	0.000000	0.000000
E2K2	2	0	0	8	0.000000	0.000000	0.000000
E2K2	3	0	0	8	0.000000	0.000000	0.000000
E2K2	4	0	0	8	0.000000	0.000000	0.000000

Failure and unknown categories

Table 130: Study J, checksum manifest, orientation 1: every registered failure and unknown category, including zeros.

Cell	C	I	M	A	T	P	R	U
E0K0	0	0	0	0	0	8	0	0
E0K1	0	0	0	0	0	8	0	0
E0K2	0	0	0	0	0	8	0	0
E1K0	0	0	0	0	0	8	0	0
E1K1	0	0	0	0	0	8	0	0
E1K2	0	0	0	0	0	8	0	0
E2K0	0	0	0	0	0	8	0	0
E2K1	0	0	0	0	0	8	0	0
E2K2	0	0	0	0	0	8	0	0

Recorded resources

Table 131: Study J, checksum manifest, orientation 1: recorded totals with unknown and planned opportunities retained; not comparative efficiency estimands.

Cell	Resource	Recorded total	U	N
E0K0	Time (s)	145.863779	0	8
E0K0	Trajectory (B)	3672	0	8
E0K0	Artifact (B)	0	0	8
E0K1	Time (s)	149.688650	0	8
E0K1	Trajectory (B)	3672	0	8
E0K1	Artifact (B)	0	0	8
E0K2	Time (s)	146.812511	0	8
E0K2	Trajectory (B)	3672	0	8
E0K2	Artifact (B)	0	0	8
E1K0	Time (s)	146.030642	0	8
E1K0	Trajectory (B)	3672	0	8
E1K0	Artifact (B)	0	0	8
E1K1	Time (s)	147.407364	0	8
E1K1	Trajectory (B)	3672	0	8
E1K1	Artifact (B)	0	0	8
E1K2	Time (s)	146.517591	0	8
E1K2	Trajectory (B)	3672	0	8
E1K2	Artifact (B)	0	0	8
E2K0	Time (s)	147.824392	0	8
E2K0	Trajectory (B)	3672	0	8
E2K0	Artifact (B)	0	0	8
E2K1	Time (s)	149.321629	0	8
E2K1	Trajectory (B)	3672	0	8
E2K1	Artifact (B)	0	0	8
E2K2	Time (s)	142.750853	0	8
E2K2	Trajectory (B)	3672	0	8
E2K2	Artifact (B)	0	0	8

All descriptive contrasts

Table 132: Study J, checksum manifest, orientation 1: all descriptive contrasts in fixed order; lower/upper are arithmetic missingness bounds, not confidence intervals.

Contrast	Point	Lower	Upper	U comp.
E0: K1 - K0	0.000000	0.000000	0.000000	0
E0: K2 - K0	0.000000	0.000000	0.000000	0
E0: K1 - K2	0.000000	0.000000	0.000000	0
E1: K1 - K0	0.000000	0.000000	0.000000	0
E1: K2 - K0	0.000000	0.000000	0.000000	0
E1: K1 - K2	0.000000	0.000000	0.000000	0
E2: K1 - K0	0.000000	0.000000	0.000000	0
E2: K2 - K0	0.000000	0.000000	0.000000	0
E2: K1 - K2	0.000000	0.000000	0.000000	0
K0: E1 - E0	0.000000	0.000000	0.000000	0

Continued on next page

Table 132 (continued): Study J, checksum manifest, orientation 1: all descriptive contrasts in fixed order; lower/upper are arithmetic missingness bounds, not confidence intervals.

Contrast	Point	Lower	Upper	U comp.
K0: E2 - E0	0.000000	0.000000	0.000000	0
K0: E2 - E1	0.000000	0.000000	0.000000	0
K1: E1 - E0	0.000000	0.000000	0.000000	0
K1: E2 - E0	0.000000	0.000000	0.000000	0
K1: E2 - E1	0.000000	0.000000	0.000000	0
K2: E1 - E0	0.000000	0.000000	0.000000	0
K2: E2 - E0	0.000000	0.000000	0.000000	0
K2: E2 - E1	0.000000	0.000000	0.000000	0
(E0 - E1): (K1 - K0)	0.000000	0.000000	0.000000	0
(E0 - E1): (K2 - K0)	0.000000	0.000000	0.000000	0
(E0 - E1): (K1 - K2)	0.000000	0.000000	0.000000	0
(E0 - E2): (K1 - K0)	0.000000	0.000000	0.000000	0
(E0 - E2): (K2 - K0)	0.000000	0.000000	0.000000	0
(E0 - E2): (K1 - K2)	0.000000	0.000000	0.000000	0
(E1 - E2): (K1 - K0)	0.000000	0.000000	0.000000	0
(E1 - E2): (K2 - K0)	0.000000	0.000000	0.000000	0
(E1 - E2): (K1 - K2)	0.000000	0.000000	0.000000	0

I.25 Asset selection, orientation 0

Complete execution

Table 133: Study J, asset selection, orientation 0: complete successes and arithmetic missingness bounds.

Cell	S	U	N	Point	Lower	Upper
E0K0	0	0	8	0.000000	0.000000	0.000000
E0K1	0	0	8	0.000000	0.000000	0.000000
E0K2	0	0	8	0.000000	0.000000	0.000000
E1K0	0	0	8	0.000000	0.000000	0.000000
E1K1	0	0	8	0.000000	0.000000	0.000000
E1K2	0	0	8	0.000000	0.000000	0.000000
E2K0	0	0	8	0.000000	0.000000	0.000000
E2K1	0	0	8	0.000000	0.000000	0.000000
E2K2	0	0	8	0.000000	0.000000	0.000000

Dependent target positions

Table 134: Study J, asset selection, orientation 0: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E0K0	1	0	0	8	0.000000	0.000000	0.000000
E0K0	2	0	0	8	0.000000	0.000000	0.000000
E0K0	3	0	0	8	0.000000	0.000000	0.000000
E0K0	4	0	0	8	0.000000	0.000000	0.000000

Continued on next page

Table 134 (continued): Study J, asset selection, orientation 0: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E0K1	1	0	0	8	0.000000	0.000000	0.000000
E0K1	2	0	0	8	0.000000	0.000000	0.000000
E0K1	3	0	0	8	0.000000	0.000000	0.000000
E0K1	4	0	0	8	0.000000	0.000000	0.000000
E0K2	1	0	0	8	0.000000	0.000000	0.000000
E0K2	2	0	0	8	0.000000	0.000000	0.000000
E0K2	3	0	0	8	0.000000	0.000000	0.000000
E0K2	4	0	0	8	0.000000	0.000000	0.000000
E1K0	1	0	0	8	0.000000	0.000000	0.000000
E1K0	2	0	0	8	0.000000	0.000000	0.000000
E1K0	3	0	0	8	0.000000	0.000000	0.000000
E1K0	4	0	0	8	0.000000	0.000000	0.000000
E1K1	1	0	0	8	0.000000	0.000000	0.000000
E1K1	2	0	0	8	0.000000	0.000000	0.000000
E1K1	3	0	0	8	0.000000	0.000000	0.000000
E1K1	4	0	0	8	0.000000	0.000000	0.000000
E1K2	1	0	0	8	0.000000	0.000000	0.000000
E1K2	2	0	0	8	0.000000	0.000000	0.000000
E1K2	3	0	0	8	0.000000	0.000000	0.000000
E1K2	4	0	0	8	0.000000	0.000000	0.000000
E2K0	1	0	0	8	0.000000	0.000000	0.000000
E2K0	2	0	0	8	0.000000	0.000000	0.000000
E2K0	3	0	0	8	0.000000	0.000000	0.000000
E2K0	4	0	0	8	0.000000	0.000000	0.000000
E2K1	1	0	0	8	0.000000	0.000000	0.000000
E2K1	2	0	0	8	0.000000	0.000000	0.000000
E2K1	3	0	0	8	0.000000	0.000000	0.000000
E2K1	4	0	0	8	0.000000	0.000000	0.000000
E2K2	1	0	0	8	0.000000	0.000000	0.000000
E2K2	2	0	0	8	0.000000	0.000000	0.000000
E2K2	3	0	0	8	0.000000	0.000000	0.000000
E2K2	4	0	0	8	0.000000	0.000000	0.000000

Failure and unknown categories

Table 135: Study J, asset selection, orientation 0: every registered failure and unknown category, including zeros.

Cell	C	I	M	A	T	P	R	U
E0K0	0	0	0	0	0	8	0	0
E0K1	0	0	0	0	0	8	0	0
E0K2	0	0	0	0	0	8	0	0
E1K0	0	0	0	0	0	8	0	0
E1K1	0	0	0	0	0	8	0	0
E1K2	0	0	0	0	0	8	0	0
E2K0	0	0	0	0	0	8	0	0
E2K1	0	0	0	0	0	8	0	0
E2K2	0	0	0	0	0	8	0	0

Recorded resources

Table 136: Study J, asset selection, orientation 0: recorded totals with unknown and planned opportunities retained; not comparative efficiency estimands.

Cell	Resource	Recorded total	U	N
E0K0	Time (s)	160.993148	0	8
E0K0	Trajectory (B)	3672	0	8
E0K0	Artifact (B)	0	0	8
E0K1	Time (s)	162.051066	0	8
E0K1	Trajectory (B)	3672	0	8
E0K1	Artifact (B)	0	0	8
E0K2	Time (s)	154.934281	0	8
E0K2	Trajectory (B)	3672	0	8
E0K2	Artifact (B)	0	0	8
E1K0	Time (s)	161.183182	0	8
E1K0	Trajectory (B)	3672	0	8
E1K0	Artifact (B)	0	0	8
E1K1	Time (s)	161.481176	0	8
E1K1	Trajectory (B)	3815	0	8
E1K1	Artifact (B)	0	0	8
E1K2	Time (s)	159.826817	0	8
E1K2	Trajectory (B)	3672	0	8
E1K2	Artifact (B)	0	0	8
E2K0	Time (s)	163.788681	0	8
E2K0	Trajectory (B)	3672	0	8
E2K0	Artifact (B)	0	0	8
E2K1	Time (s)	158.169740	0	8
E2K1	Trajectory (B)	3672	0	8
E2K1	Artifact (B)	0	0	8
E2K2	Time (s)	156.914769	0	8
E2K2	Trajectory (B)	3672	0	8
E2K2	Artifact (B)	0	0	8

All descriptive contrasts

Table 137: Study J, asset selection, orientation 0: all descriptive contrasts in fixed order; lower/upper are arithmetic missingness bounds, not confidence intervals.

Contrast	Point	Lower	Upper	U comp.
E0: K1 - K0	0.000000	0.000000	0.000000	0
E0: K2 - K0	0.000000	0.000000	0.000000	0
E0: K1 - K2	0.000000	0.000000	0.000000	0
E1: K1 - K0	0.000000	0.000000	0.000000	0
E1: K2 - K0	0.000000	0.000000	0.000000	0
E1: K1 - K2	0.000000	0.000000	0.000000	0
E2: K1 - K0	0.000000	0.000000	0.000000	0
E2: K2 - K0	0.000000	0.000000	0.000000	0
E2: K1 - K2	0.000000	0.000000	0.000000	0
K0: E1 - E0	0.000000	0.000000	0.000000	0

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Table 137 (continued): Study J, asset selection, orientation 0: all descriptive contrasts in fixed order; lower/upper are arithmetic missingness bounds, not confidence intervals.

Contrast	Point	Lower	Upper	U comp.
K0: E2 - E0	0.000000	0.000000	0.000000	0
K0: E2 - E1	0.000000	0.000000	0.000000	0
K1: E1 - E0	0.000000	0.000000	0.000000	0
K1: E2 - E0	0.000000	0.000000	0.000000	0
K1: E2 - E1	0.000000	0.000000	0.000000	0
K2: E1 - E0	0.000000	0.000000	0.000000	0
K2: E2 - E0	0.000000	0.000000	0.000000	0
K2: E2 - E1	0.000000	0.000000	0.000000	0
(E0 - E1): (K1 - K0)	0.000000	0.000000	0.000000	0
(E0 - E1): (K2 - K0)	0.000000	0.000000	0.000000	0
(E0 - E1): (K1 - K2)	0.000000	0.000000	0.000000	0
(E0 - E2): (K1 - K0)	0.000000	0.000000	0.000000	0
(E0 - E2): (K2 - K0)	0.000000	0.000000	0.000000	0
(E0 - E2): (K1 - K2)	0.000000	0.000000	0.000000	0
(E1 - E2): (K1 - K0)	0.000000	0.000000	0.000000	0
(E1 - E2): (K2 - K0)	0.000000	0.000000	0.000000	0
(E1 - E2): (K1 - K2)	0.000000	0.000000	0.000000	0

I.26 Asset selection, orientation 1

Complete execution

Table 138: Study J, asset selection, orientation 1: complete successes and arithmetic missingness bounds.

Cell	S	U	N	Point	Lower	Upper
E0K0	0	0	8	0.000000	0.000000	0.000000
E0K1	0	0	8	0.000000	0.000000	0.000000
E0K2	0	0	8	0.000000	0.000000	0.000000
E1K0	0	0	8	0.000000	0.000000	0.000000
E1K1	0	0	8	0.000000	0.000000	0.000000
E1K2	0	0	8	0.000000	0.000000	0.000000
E2K0	0	0	8	0.000000	0.000000	0.000000
E2K1	0	0	8	0.000000	0.000000	0.000000
E2K2	0	0	8	0.000000	0.000000	0.000000

Dependent target positions

Table 139: Study J, asset selection, orientation 1: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E0K0	1	0	0	8	0.000000	0.000000	0.000000
E0K0	2	0	0	8	0.000000	0.000000	0.000000
E0K0	3	0	0	8	0.000000	0.000000	0.000000
E0K0	4	0	0	8	0.000000	0.000000	0.000000

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Table 139 (continued): Study J, asset selection, orientation 1: dependent target positions and arithmetic missingness bounds; targets are not independent opportunities.

Cell	Target	S	U	N	Point	Lower	Upper
E0K1	1	0	0	8	0.000000	0.000000	0.000000
E0K1	2	0	0	8	0.000000	0.000000	0.000000
E0K1	3	0	0	8	0.000000	0.000000	0.000000
E0K1	4	0	0	8	0.000000	0.000000	0.000000
E0K2	1	0	0	8	0.000000	0.000000	0.000000
E0K2	2	0	0	8	0.000000	0.000000	0.000000
E0K2	3	0	0	8	0.000000	0.000000	0.000000
E0K2	4	0	0	8	0.000000	0.000000	0.000000
E1K0	1	0	0	8	0.000000	0.000000	0.000000
E1K0	2	0	0	8	0.000000	0.000000	0.000000
E1K0	3	0	0	8	0.000000	0.000000	0.000000
E1K0	4	0	0	8	0.000000	0.000000	0.000000
E1K1	1	0	0	8	0.000000	0.000000	0.000000
E1K1	2	0	0	8	0.000000	0.000000	0.000000
E1K1	3	0	0	8	0.000000	0.000000	0.000000
E1K1	4	0	0	8	0.000000	0.000000	0.000000
E1K2	1	0	0	8	0.000000	0.000000	0.000000
E1K2	2	0	0	8	0.000000	0.000000	0.000000
E1K2	3	0	0	8	0.000000	0.000000	0.000000
E1K2	4	0	0	8	0.000000	0.000000	0.000000
E2K0	1	0	0	8	0.000000	0.000000	0.000000
E2K0	2	0	0	8	0.000000	0.000000	0.000000
E2K0	3	0	0	8	0.000000	0.000000	0.000000
E2K0	4	0	0	8	0.000000	0.000000	0.000000
E2K1	1	0	0	8	0.000000	0.000000	0.000000
E2K1	2	0	0	8	0.000000	0.000000	0.000000
E2K1	3	0	0	8	0.000000	0.000000	0.000000
E2K1	4	0	0	8	0.000000	0.000000	0.000000
E2K2	1	0	0	8	0.000000	0.000000	0.000000
E2K2	2	0	0	8	0.000000	0.000000	0.000000
E2K2	3	0	0	8	0.000000	0.000000	0.000000
E2K2	4	0	0	8	0.000000	0.000000	0.000000

Failure and unknown categories

Table 140: Study J, asset selection, orientation 1: every registered failure and unknown category, including zeros.

Cell	C	I	M	A	T	P	R	U
E0K0	0	0	0	0	0	8	0	0
E0K1	0	0	0	0	0	8	0	0
E0K2	0	0	0	0	0	8	0	0
E1K0	0	0	0	0	0	8	0	0
E1K1	0	0	0	0	0	8	0	0
E1K2	0	0	0	0	0	8	0	0
E2K0	0	0	0	0	0	8	0	0
E2K1	0	0	0	0	0	8	0	0
E2K2	0	0	0	0	0	8	0	0

Recorded resources

Table 141: Study J, asset selection, orientation 1: recorded totals with unknown and planned opportunities retained; not comparative efficiency estimands.

Cell	Resource	Recorded total	U	N
E0K0	Time (s)	164.590111	0	8
E0K0	Trajectory (B)	3672	0	8
E0K0	Artifact (B)	0	0	8
E0K1	Time (s)	165.248786	0	8
E0K1	Trajectory (B)	3672	0	8
E0K1	Artifact (B)	0	0	8
E0K2	Time (s)	170.511116	0	8
E0K2	Trajectory (B)	3672	0	8
E0K2	Artifact (B)	0	0	8
E1K0	Time (s)	166.360959	0	8
E1K0	Trajectory (B)	3672	0	8
E1K0	Artifact (B)	0	0	8
E1K1	Time (s)	165.690034	0	8
E1K1	Trajectory (B)	3672	0	8
E1K1	Artifact (B)	0	0	8
E1K2	Time (s)	167.631427	0	8
E1K2	Trajectory (B)	3672	0	8
E1K2	Artifact (B)	0	0	8
E2K0	Time (s)	166.159065	0	8
E2K0	Trajectory (B)	3815	0	8
E2K0	Artifact (B)	0	0	8
E2K1	Time (s)	165.792650	0	8
E2K1	Trajectory (B)	3672	0	8
E2K1	Artifact (B)	0	0	8
E2K2	Time (s)	164.357599	0	8
E2K2	Trajectory (B)	3958	0	8
E2K2	Artifact (B)	0	0	8

All descriptive contrasts

Table 142: Study J, asset selection, orientation 1: all descriptive contrasts in fixed order; lower/upper are arithmetic missingness bounds, not confidence intervals.

Contrast	Point	Lower	Upper	U comp.
E0: K1 - K0	0.000000	0.000000	0.000000	0
E0: K2 - K0	0.000000	0.000000	0.000000	0
E0: K1 - K2	0.000000	0.000000	0.000000	0
E1: K1 - K0	0.000000	0.000000	0.000000	0
E1: K2 - K0	0.000000	0.000000	0.000000	0
E1: K1 - K2	0.000000	0.000000	0.000000	0
E2: K1 - K0	0.000000	0.000000	0.000000	0
E2: K2 - K0	0.000000	0.000000	0.000000	0
E2: K1 - K2	0.000000	0.000000	0.000000	0
K0: E1 - E0	0.000000	0.000000	0.000000	0

Continued on next page

Table 142 (continued): Study J, asset selection, orientation 1: all descriptive contrasts in fixed order; lower/upper are arithmetic missingness bounds, not confidence intervals.

Contrast	Point	Lower	Upper	U comp.
K0: E2 - E0	0.000000	0.000000	0.000000	0
K0: E2 - E1	0.000000	0.000000	0.000000	0
K1: E1 - E0	0.000000	0.000000	0.000000	0
K1: E2 - E0	0.000000	0.000000	0.000000	0
K1: E2 - E1	0.000000	0.000000	0.000000	0
K2: E1 - E0	0.000000	0.000000	0.000000	0
K2: E2 - E0	0.000000	0.000000	0.000000	0
K2: E2 - E1	0.000000	0.000000	0.000000	0
(E0 - E1): (K1 - K0)	0.000000	0.000000	0.000000	0
(E0 - E1): (K2 - K0)	0.000000	0.000000	0.000000	0
(E0 - E1): (K1 - K2)	0.000000	0.000000	0.000000	0
(E0 - E2): (K1 - K0)	0.000000	0.000000	0.000000	0
(E0 - E2): (K2 - K0)	0.000000	0.000000	0.000000	0
(E0 - E2): (K1 - K2)	0.000000	0.000000	0.000000	0
(E1 - E2): (K1 - K0)	0.000000	0.000000	0.000000	0
(E1 - E2): (K2 - K0)	0.000000	0.000000	0.000000	0
(E1 - E2): (K1 - K2)	0.000000	0.000000	0.000000	0

APPENDIX J. COMPLETE FIXED-ORDER STUDY K REPORT

Provenance: analysis schema `study_k_stage1_analysis_draft_v1`; terminal receipt schema `study_k_stage1_single_look_receipt_candidate_v1`; manifest SHA-256 `7c999ca81f17a4cd738b382b0c8914b75459178f23e583e3dd5d1888d31f947c`; report SHA-256 `0da35a94206333902f4fa2ba8f65b23950562b755e7c91218ed26aebecc30996`; schedule SHA-256 `9467ad66283f9f7e563c195b321fe67fbff5b64695e96efd7aac55c4f8684640`; bank SHA-256 `27647a306570ac0acd1f8751fab01e24db2287455c94499fd3ff191edcc758f9`; terminal SHA-256 `0332ba638e29d2461bc3b1116b7a6df2db1688f4a0518132caa369519443bfc5`; trusted-bundle SHA-256 `c623775d01b761d288da13be01582fd8bbfaae8fe840fce3567f3ec3bc290525`. The terminal receipt records 1536 complete opportunities. All decimal fields below are rounded to six places; the single-look JSON is authoritative for exact values.

Panel: 8 families × 48 blocks; 1536 opportunities; protected half-width 0.151073; claim scope `fixed_eight_rule_lineages_and_researcher_constructed_tasks_only`.

Table 143: Study K all-eight arm means and zero-scored process failures, in fixed cell order.

Cell	All-eight mean	Process failures / 384
N/N	0.867350	37 / 384
E/N	0.919434	26 / 384
N/E	0.921061	26 / 384
E/E	0.924805	24 / 384

Table 144: Study K all-eight pairwise contrasts in the registered order.

Fixed pairwise contrast	All-eight point
N/E-N/N	0.053711

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Table 144 (continued): Study K all-eight pairwise contrasts in the registered order.

Fixed pairwise contrast	All-eight point
E/N-N/N	0.052083
E/E-N/N	0.057454
N/E-E/N	0.001628
E/E-N/E	0.003743
E/E-E/N	0.005371

All-eight factorial interaction: -0.048340.

Table 145: Study K arm means by prespecified oracle-risk stratum.

Oracle-risk stratum	N/N	E/N	N/E	E/E
candidate_no_direct_oracle	0.916341	0.970052	0.972331	0.963542
direct_oracle_risk	0.818359	0.868815	0.869792	0.886068

Table 146: Study K family-level arm means, contrasts, failures and interaction. Panels retain the source field order and all eight lineages.

(a) Arm means

Family	N/N	E/N	N/E	E/E
json_patch	0.998698	1.000000	1.000000	0.979167
toml_encoder	0.990885	0.997396	0.998698	0.993490
unicode_nfkc	1.000000	1.000000	1.000000	1.000000
json_schema	0.940104	0.924479	0.932292	0.923177
yaml_decoder	0.481771	0.583333	0.604167	0.710938
sqllogictest_formatter	0.735677	0.958333	0.958333	0.958333
git_ignore	0.833333	0.934896	0.916667	0.895833
xml_namespaces	0.958333	0.957031	0.958333	0.937500

(b) Contrasts, failures and interaction

Family	N/E−N/N	N/E−E/N	Failures N/N,E/N, N/E,E/E	Interaction
json_patch	0.001302	0.000000	0,0,0,1	-0.022135
toml_encoder	0.007812	0.001302	0,0,0,0	-0.011719
unicode_nfkc	0.000000	0.000000	0,0,0,0	0.000000
json_schema	-0.007812	0.007812	1,1,1,1	0.006510
yaml_decoder	0.122396	0.020833	23,18,17,12	0.005208
sqllogictest_formatter	0.222656	0.000000	3,2,2,2	-0.222656
git_ignore	0.083333	-0.018229	8,3,4,5	-0.122396
xml_namespaces	0.000000	0.001302	2,2,2,3	-0.019531

All six family contrasts, in the registered pair order:

Table 147: Study K all six family contrasts in the registered pair order. Panels retain the source field order and all eight lineages.

(a) First three registered contrasts

Family	N/E-N/N	E/N-N/N	E/E-N/N
json_patch	0.001302	0.001302	-0.019531
toml_encoder	0.007812	0.006510	0.002604
unicode_nfkc	0.000000	0.000000	0.000000
json_schema	-0.007812	-0.015625	-0.016927
yaml_decoder	0.122396	0.101563	0.229167
sqllogictest_formatter	0.222656	0.222656	0.222656
git_ignore	0.083333	0.101562	0.062500
xml_namespaces	0.000000	-0.001302	-0.020833

(b) Final three registered contrasts

Family	N/E-E/N	E/E-N/E	E/E-E/N
json_patch	0.000000	-0.020833	-0.020833
toml_encoder	0.001302	-0.005208	-0.003906
unicode_nfkc	0.000000	0.000000	0.000000
json_schema	0.007812	-0.009115	-0.001302
yaml_decoder	0.020833	0.106771	0.127604
sqllogictest_formatter	0.000000	0.000000	0.000000
git_ignore	-0.018229	-0.020833	-0.039062
xml_namespaces	0.001302	-0.020833	-0.019531

Branch-correct counts include zero contribution from process failures. Each cell has a fixed denominator of 192 prespecified item slots per branch; a failed opportunity contributes zero by rule but no selected item verdicts.

Table 148: Study K branch-correct counts in fixed family and cell order; process failures contribute zero.

Family	Cell	Branch 1	Branch 2	Branch 3	Branch 4	Denominator per branch
json_patch	N/N	192	191	192	192	192
json_patch	E/N	192	192	192	192	192
json_patch	N/E	192	192	192	192	192
json_patch	E/E	188	188	188	188	192
toml_encoder	N/N	192	192	185	192	192
toml_encoder	E/N	192	192	190	192	192
toml_encoder	N/E	192	192	191	192	192
toml_encoder	E/E	192	192	187	192	192
unicode_nfkc	N/N	192	192	192	192	192
unicode_nfkc	E/N	192	192	192	192	192
unicode_nfkc	N/E	192	192	192	192	192
unicode_nfkc	E/E	192	192	192	192	192
json_schema	N/N	162	188	186	186	192
json_schema	E/N	146	188	188	188	192
json_schema	N/E	152	188	188	188	192
json_schema	E/E	145	188	188	188	192

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Table 148 (continued): Study K branch-correct counts in fixed family and cell order; process failures contribute zero.

Family	Cell	Branch 1	Branch 2	Branch 3	Branch 4	Denominator per branch
yaml_decoder	N/N	88	100	84	98	192
yaml_decoder	E/N	104	120	104	120	192
yaml_decoder	N/E	106	122	112	124	192
yaml_decoder	E/E	132	143	127	144	192
sqllogictest_formatter	N/N	175	175	175	40	192
sqllogictest_formatter	E/N	184	184	184	184	192
sqllogictest_formatter	N/E	184	184	184	184	192
sqllogictest_formatter	E/E	184	184	184	184	192
git_ignore	N/N	160	160	160	160	192
git_ignore	E/N	180	180	178	180	192
git_ignore	N/E	176	176	176	176	192
git_ignore	E/E	172	172	172	172	192
xml_namespaces	N/N	184	184	184	184	192
xml_namespaces	E/N	184	184	183	184	192
xml_namespaces	N/E	184	184	184	184	192
xml_namespaces	E/E	180	180	180	180	192

Operational failures are reported for every arm and family, counted as zero in the protected contrasts. Their cause and an effect conditional on their absence are not inferred here. Public rule authorship does not make the constructed task or Skill independently authored.